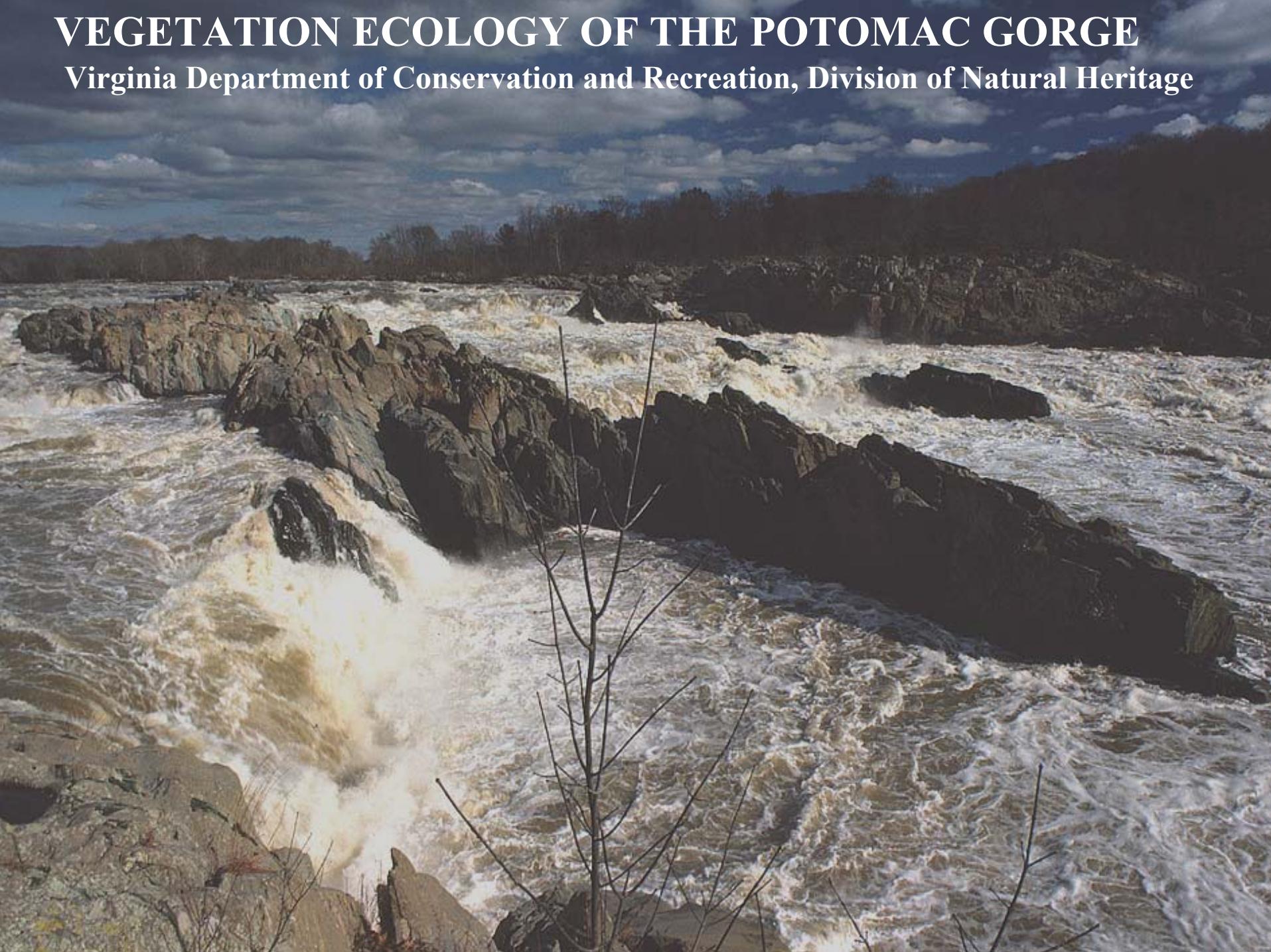


# VEGETATION ECOLOGY OF THE POTOMAC GORGE

Virginia Department of Conservation and Recreation, Division of Natural Heritage





## The Potomac Gorge

- **entrenched valley of the Potomac River as it passes through the Piedmont “fall line” for 24 km from Great Falls to Washington, D.C.**
- **considered one of the most important natural areas in the Mid-Atlantic region**
- **3900 ha conservation site containing >400 occurrences of 200 rare plants and communities (TNC)**

# **Potomac Gorge Vegetation Ecology Study**

## **Virginia DCR, Division of Natural Heritage**

- Three-year study (2002-2005) dedicated to the inventory and classification of ecological communities on the Virginia side, and integration with previous work on the Maryland/D.C. side.
- Funded (in part) by the National Park Service, George Washington Memorial Parkway; supported by The Nature Conservancy, Fairfax County Park Authority, Madeira School.
- Application of a “coarse filter” approach to biological conservation that emphasizes the protection of ecological systems and all associated organisms.

# **Objectives of the Potomac Gorge Vegetation Ecology Study by VDCR-DNH**

- Expand and refine the partial existing information on ecological communities of the Gorge
- Facilitate conservation planning based on landscape-scale targets and criteria
- Provide an ecologically and biologically based framework for management / stewardship activities and site mapping
- Reduce redundancy in management strategies for multiple rare species
- Assist in targeting and prioritizing future inventory work

## **Existing vegetation ecology studies of the Potomac Gorge**

**Abrams, M.D. and C.A. Copenheaver.** 1999. Temporal variation and species recruitment and dendroecology of an old-growth white oak forest in the Virginia Piedmont, USA. *Forest Ecology and Management* 124: 275-284.

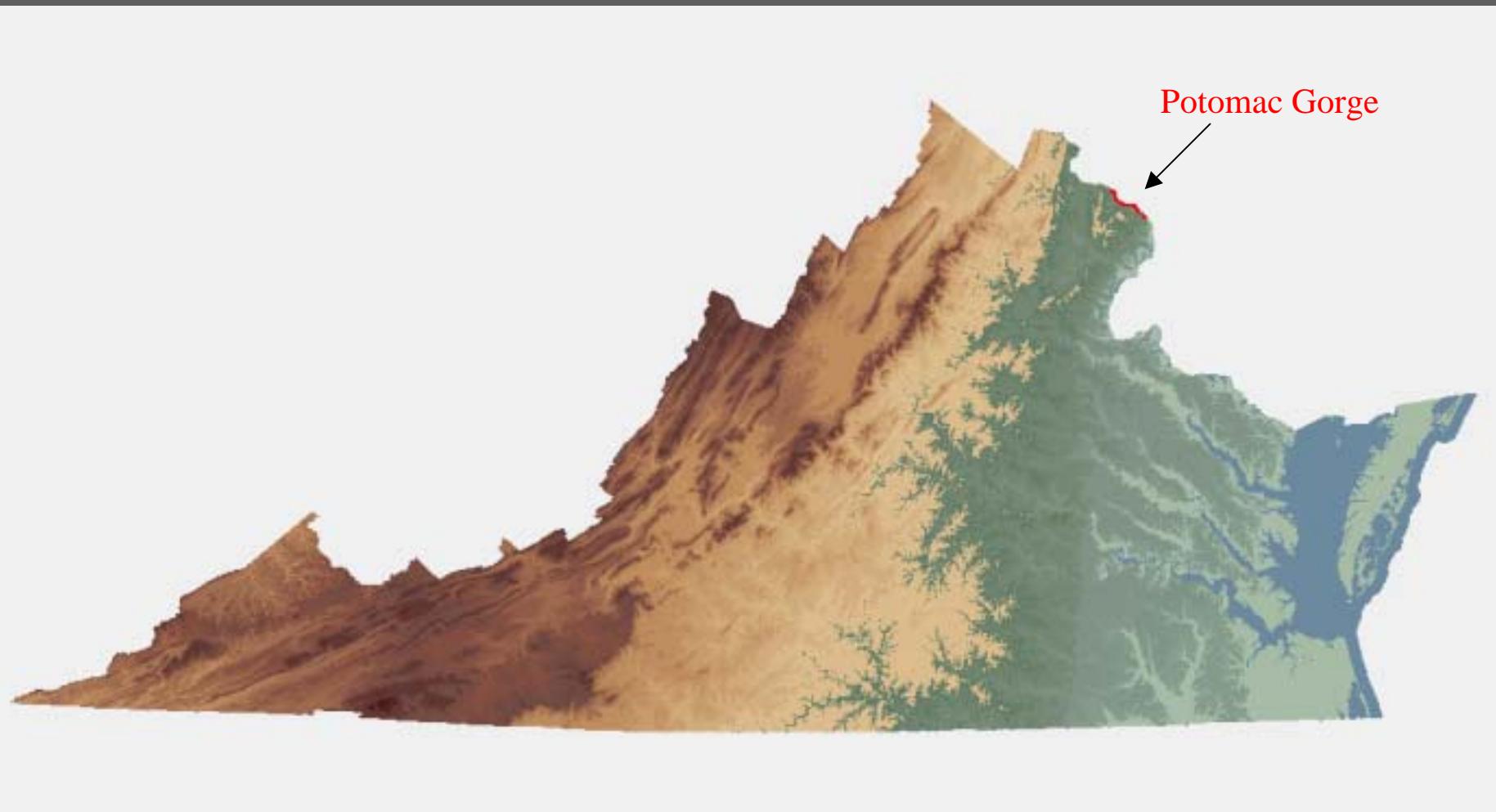
**Lea, C.** 2000. Plant communities of the Potomac Gorge and their relationship to fluvial factors. Unpublished M.S. Thesis, George Mason University. 219 pp.

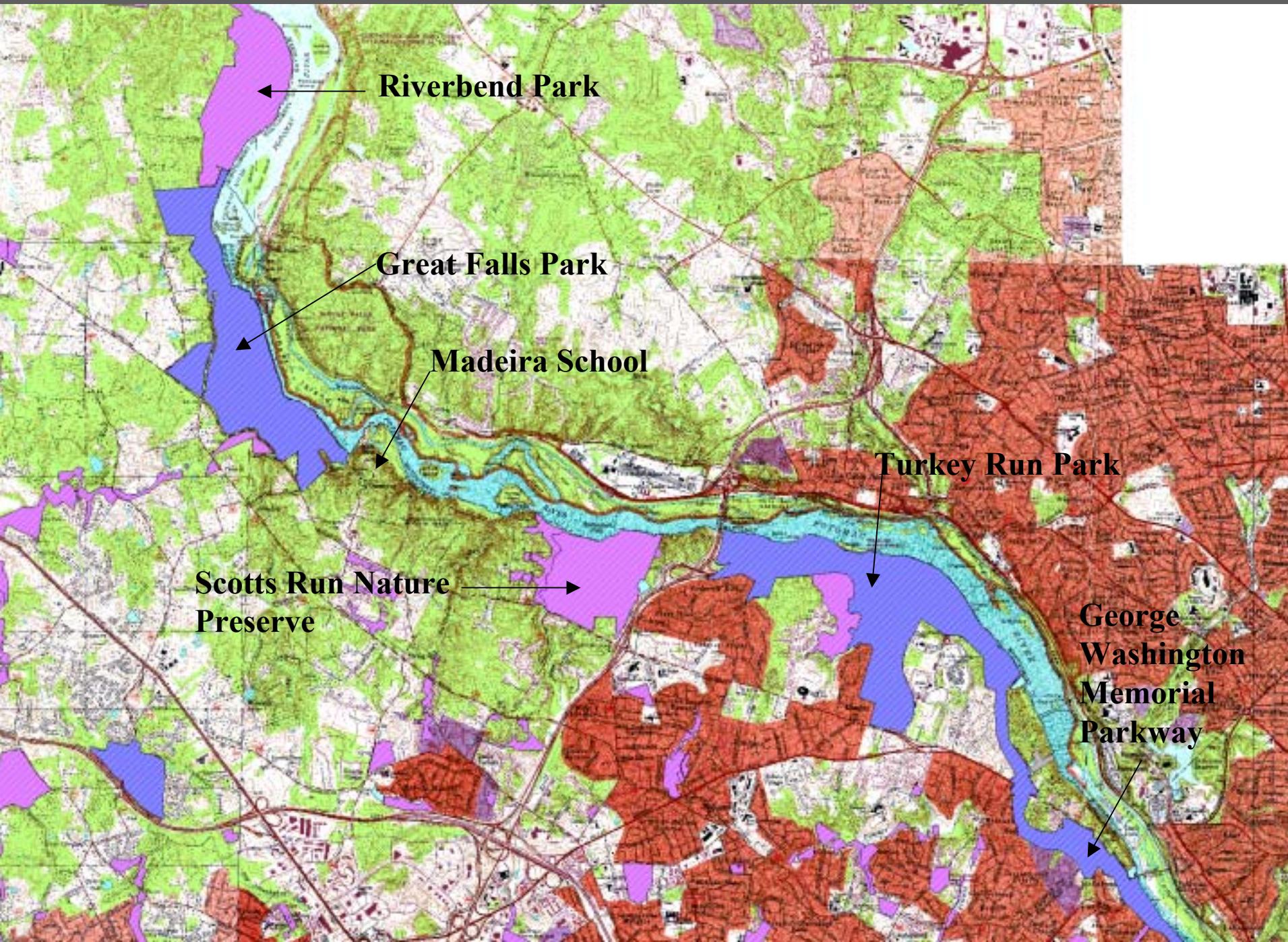
**Lea, C. and R. Simmons.** USGS/NPS Vegetation Mapping Program: vegetation classification of the Gold Mine Tract, C&O Canal National Historical Park. Unpublished report submitted to the National Park Service and The Nature Conservancy. 67 pp.

A wide-angle photograph of a river scene. The foreground is filled with dark, choppy water. On the left bank, there's a mix of bare trees and some green vegetation. The background shows a dense forest of mostly bare trees under a clear blue sky.

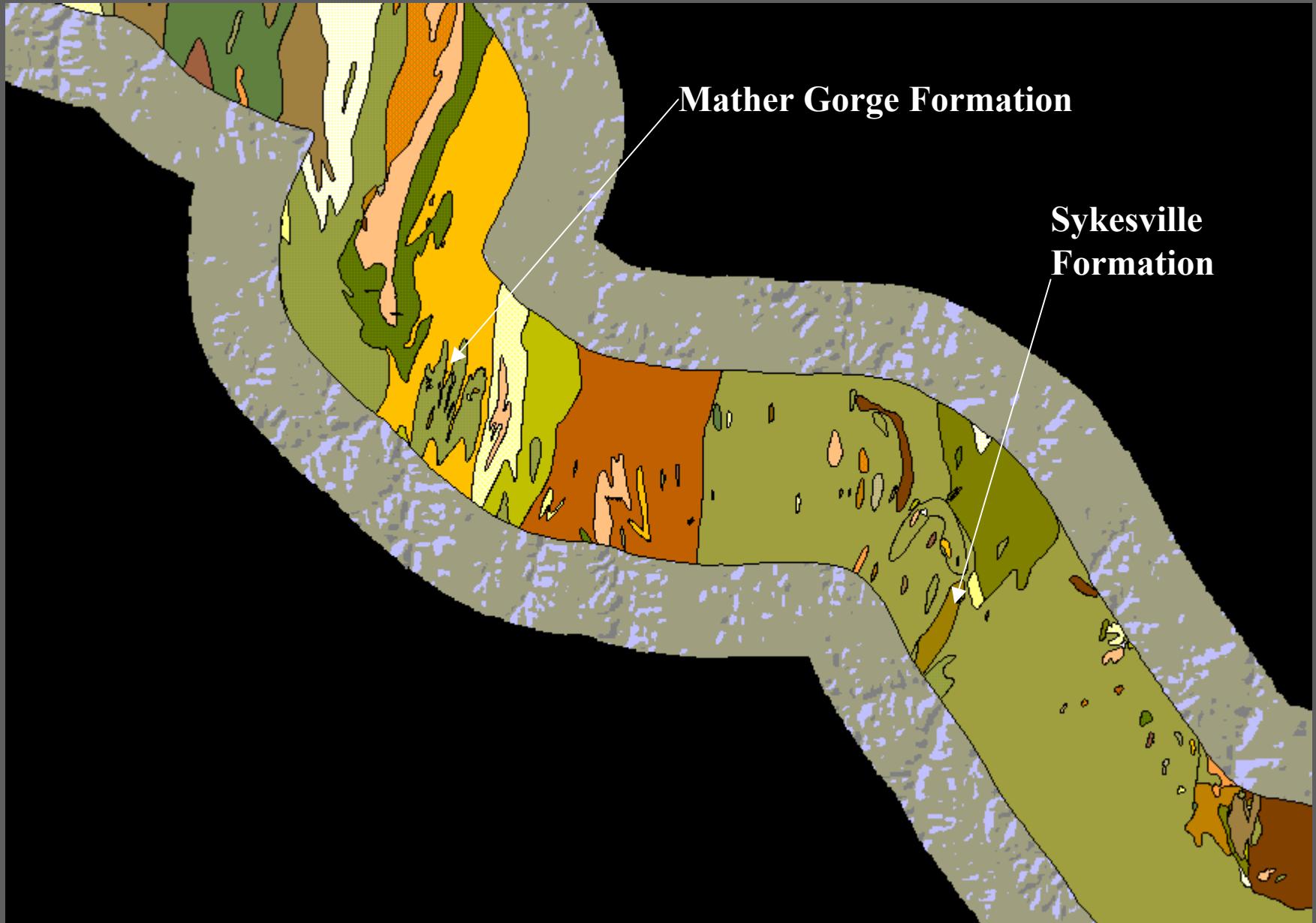
# STUDY AREA

# Study Area Location





# Bedrock Geology



# MATHER GORGE FORMATION

Quartzose and mica schist;  
metagraywacke; migmatitic schist;  
mafic, ultramafic, and granitoid  
intrusions and debris.



Pothole in migmatitic schist



Interbedded metagrawacke and schist

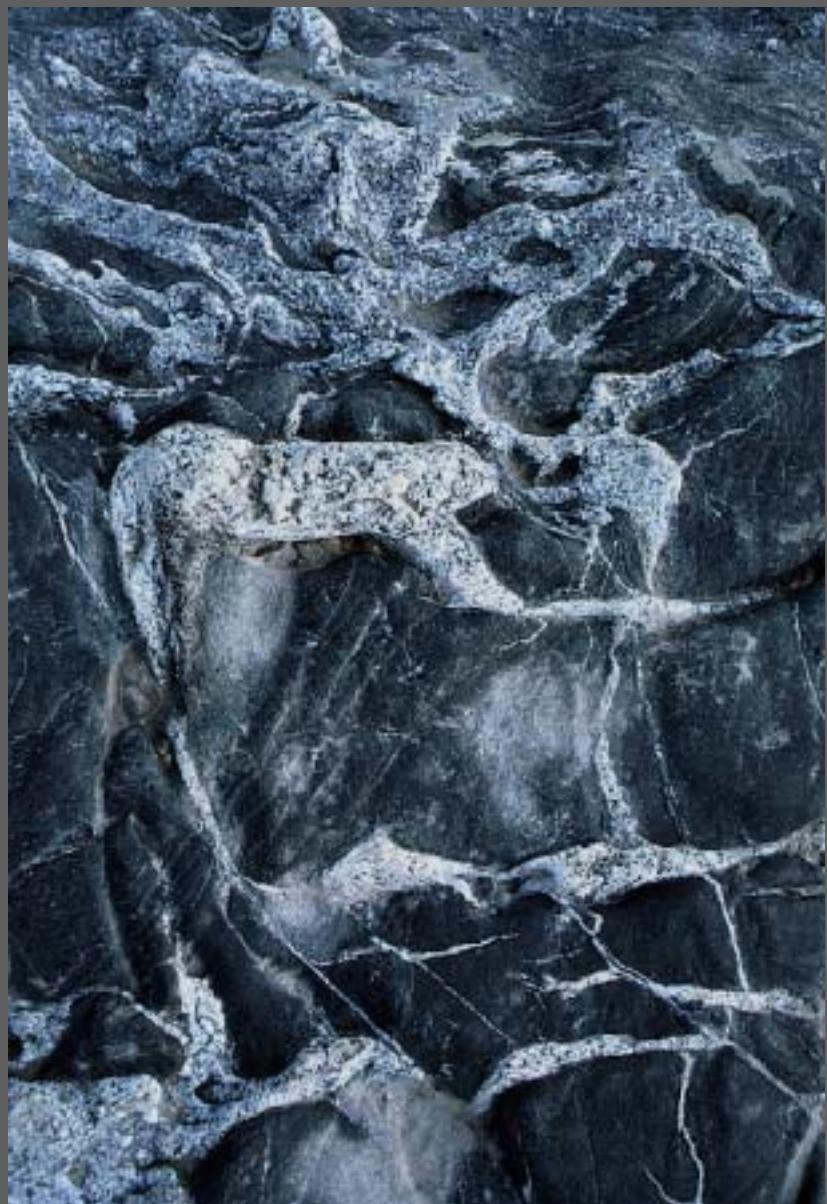
# SYKESVILLE FORMATION

Metasedimentary melange; quartzo-feldpathic matrix with heterogeneous fragments and mappable intrusions of mafic, ultramafic, and granitoid rocks.



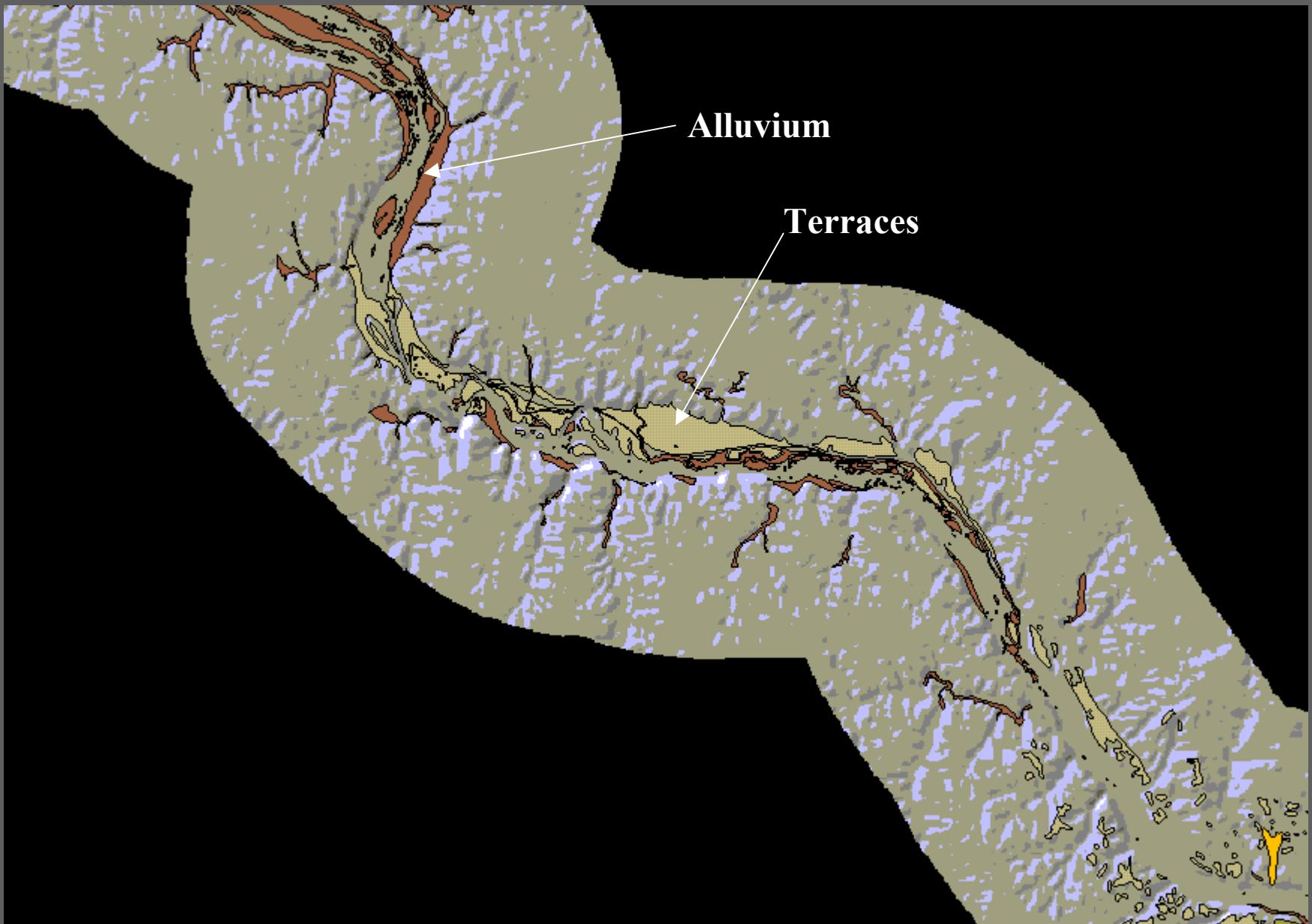
Sykesville matrix  
with fragments

Photo: USGS

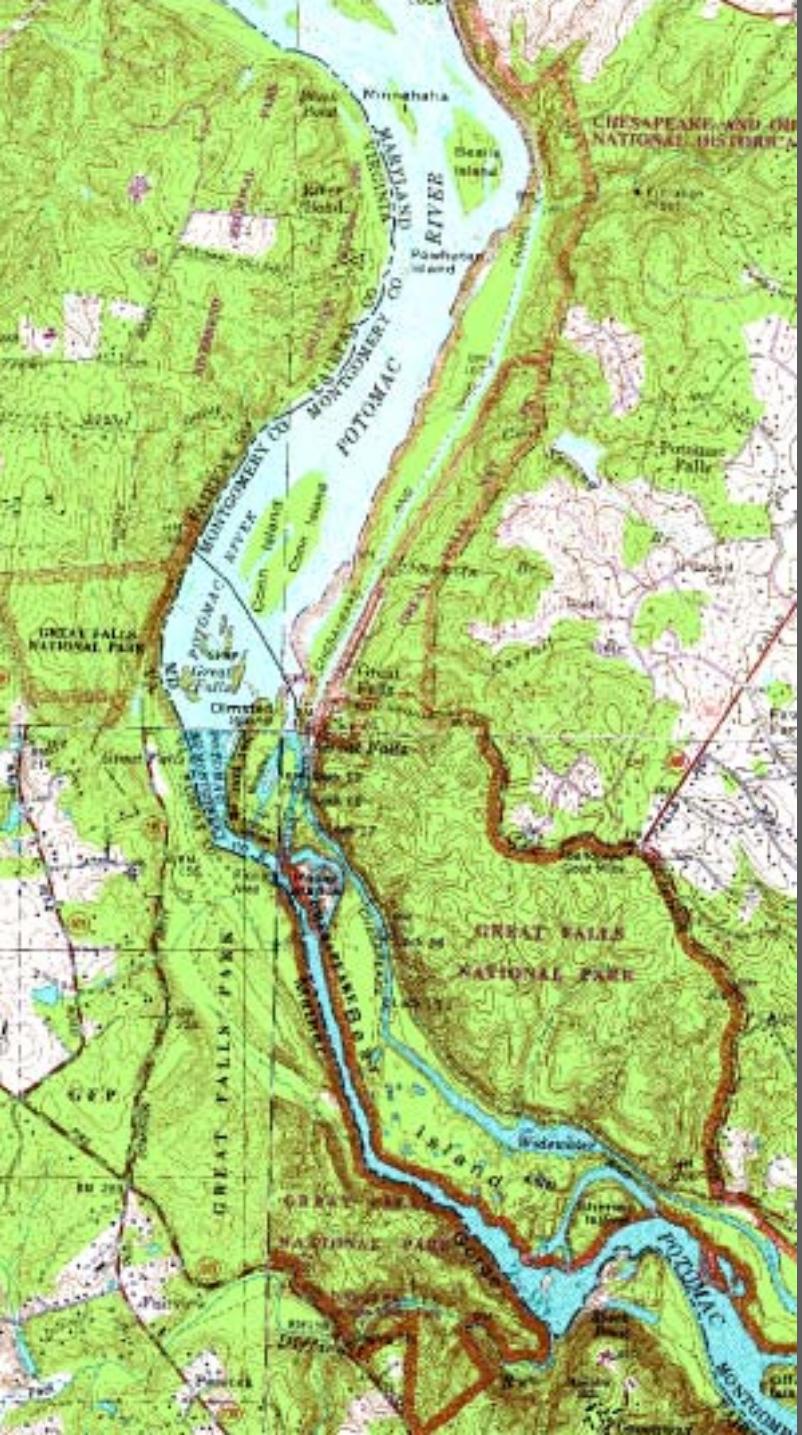


Melted Sykesville

# Surficial Geology



# Potomac Gorge: Upper Section



# Above Great Falls



# Channel at Great Falls



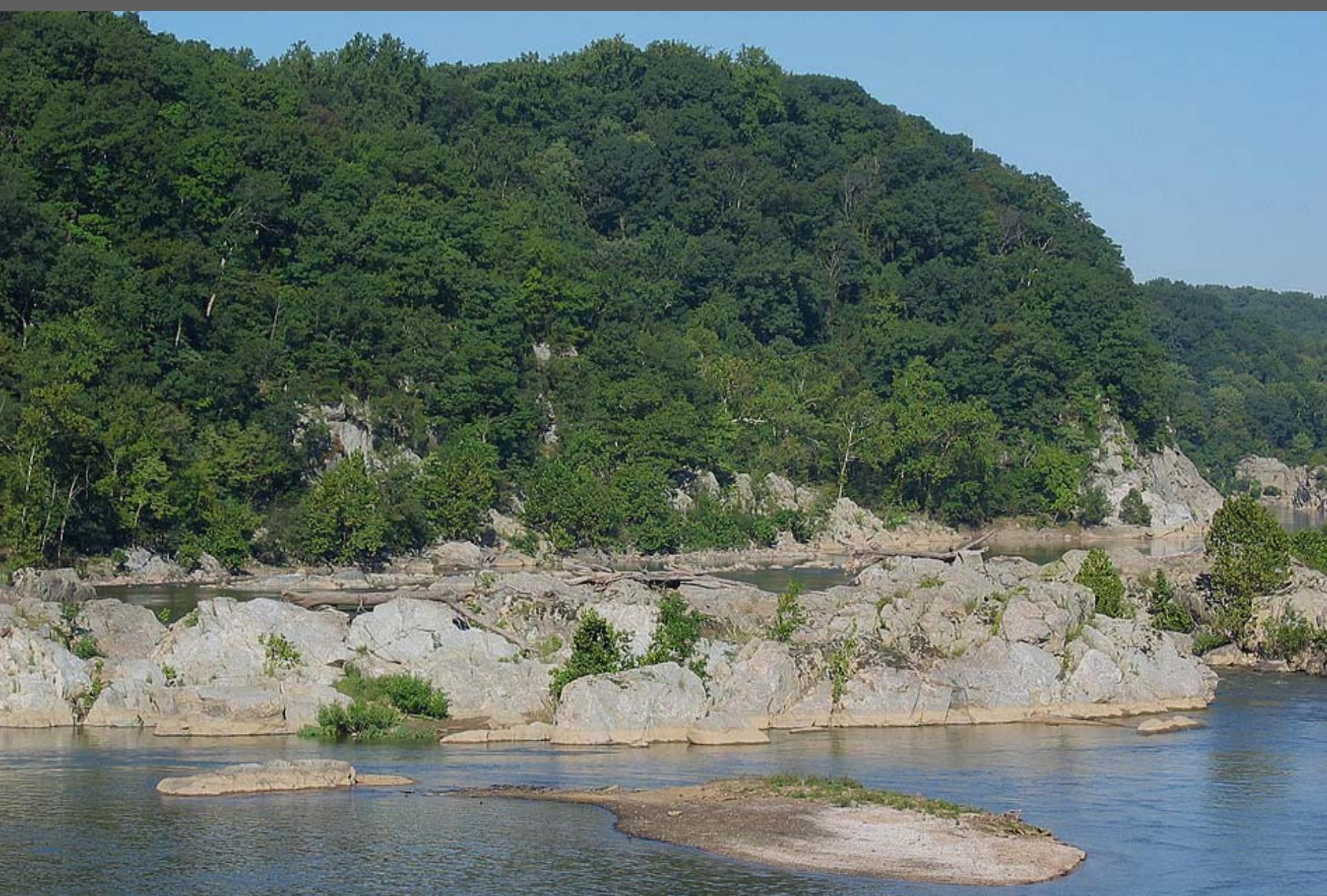
# View of Great Falls from bedrock terrace



# Upper Mather Gorge



# Lower Mather Gorge



# Difficult Run



# Potomac Gorge: Middle Section



# Bedrock terrace at Madeira School



# Black Pond at Madeira School



# Channel around Offut Island



# Offutt Island and Virginia shore





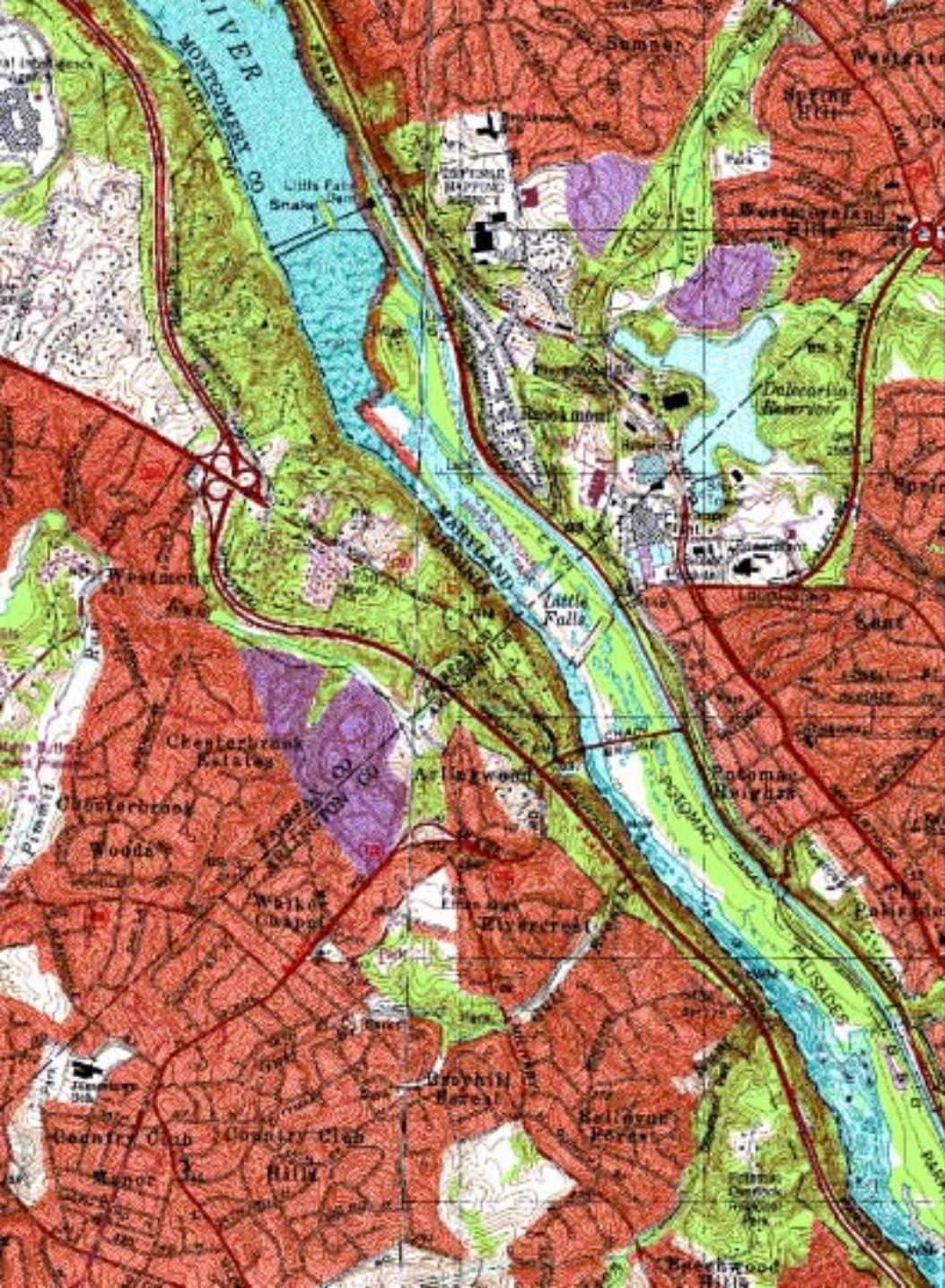
**Scott's Run and Stubblefield Falls**



# Below Stubblefield Falls



# Potomac Gorge: Lower Section



# Little Falls



# Arlington bluffs and Chain Bridge Flats





## Gulf Branch and rocky Arlington shore



# Potomac Gorge: Hydrology and Flooding Regimes



**View of Mather Gorge with normal water level**



Same view during flooding following Hurricane Agnes, 1972

# Inundated floodplain forest, December, 2003



# Flood damage near Cabin John



# Potomac Gorge ice flows





**Mechanical damage  
to floodplain forest  
from ice floods**

# Low flows and seasonally exposed shores



# **Factors contributing to the biotic richness of the Potomac Gorge**

- Complex geology, geomorphology, and topography.
- Diversity of soils and edaphic environments, including swamps, rich alluvium, various upland soils weathered in residuum, and rock outcrops.
- Diversity of wetlands and hydrologic regimes.
- A large river with largely intact, powerful flooding regime.
- A major water course serving as a optimal corridor for ongoing migrations of plants between the Appalachians and Coastal Plain.

A photograph of a large, leafless tree branch silhouetted against a bright blue sky with scattered white clouds. The branch hangs over a dark blue body of water. In the background, a dense forest lines the shore, leading to a range of mountains under a clear sky.

# METHODS

# Field Sampling Methodology

## PLOT SIZE

- 400 sq. m. (16 X 25 m standard) for Forests and Woodlands
- 100 sq. m. (8 X 12.5 m standard) for Shrubland and Herbaceous Vegetation

## LOCATION DATA

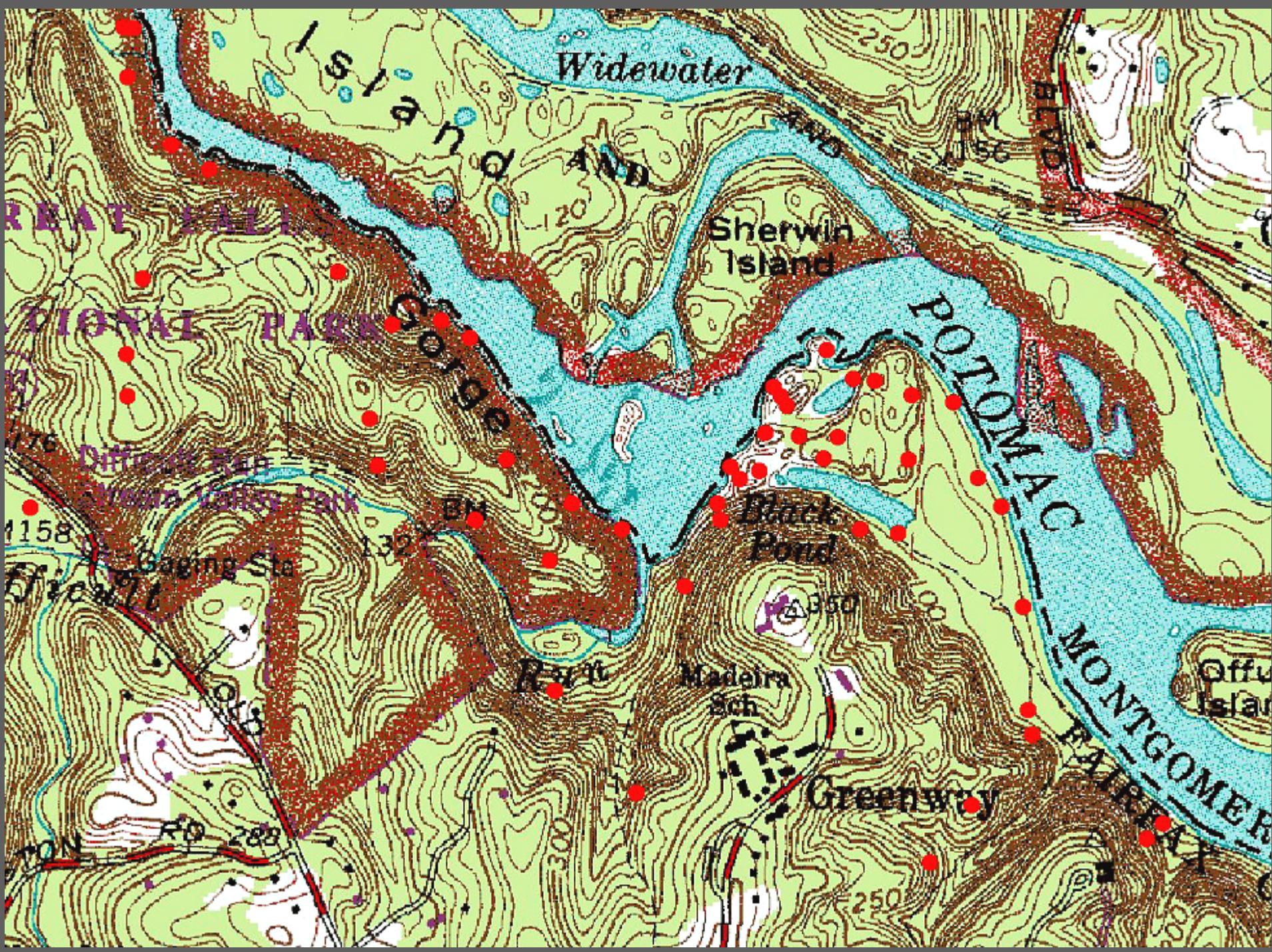
- recorded to  $\leq 10$  m accuracy with GPS unit

## VEGETATION DATA

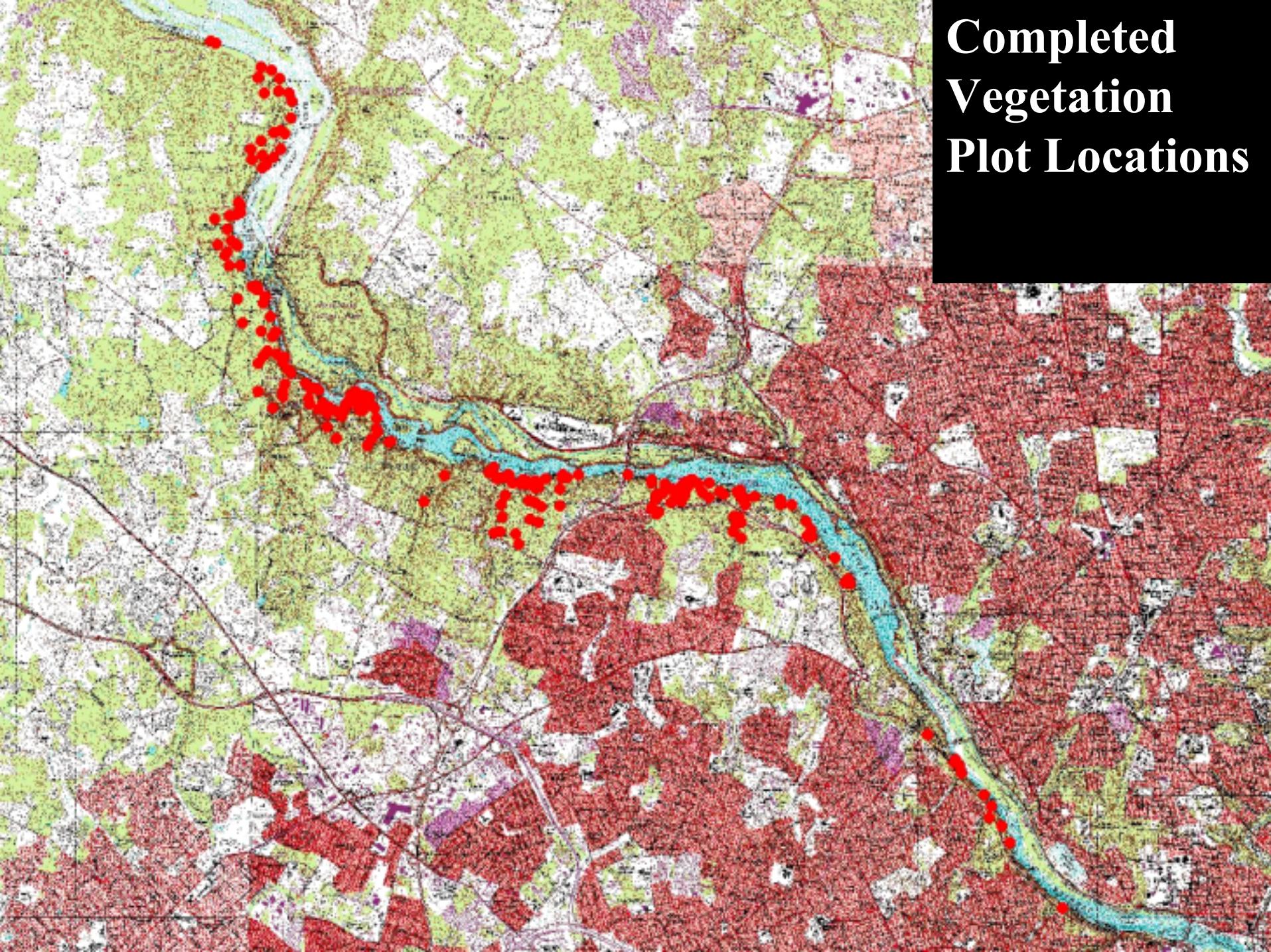
- Presence and cover of all vascular taxa at six height strata
- Maximum canopy height
- Measurements of all woody stems  $\geq 2.5$  cm DBH

## ENVIRONMENTAL DATA

- Topographic Position
- Cover of surface substrates (wood, bedrock, boulders, etc.)
- Slope inclination
- Aspect
- Slope shape (horizontally and vertically)
- Soil samples (3-4 combined) for chemical and textural analyses



# Completed Vegetation Plot Locations



# Seasonal variation in vegetation composition

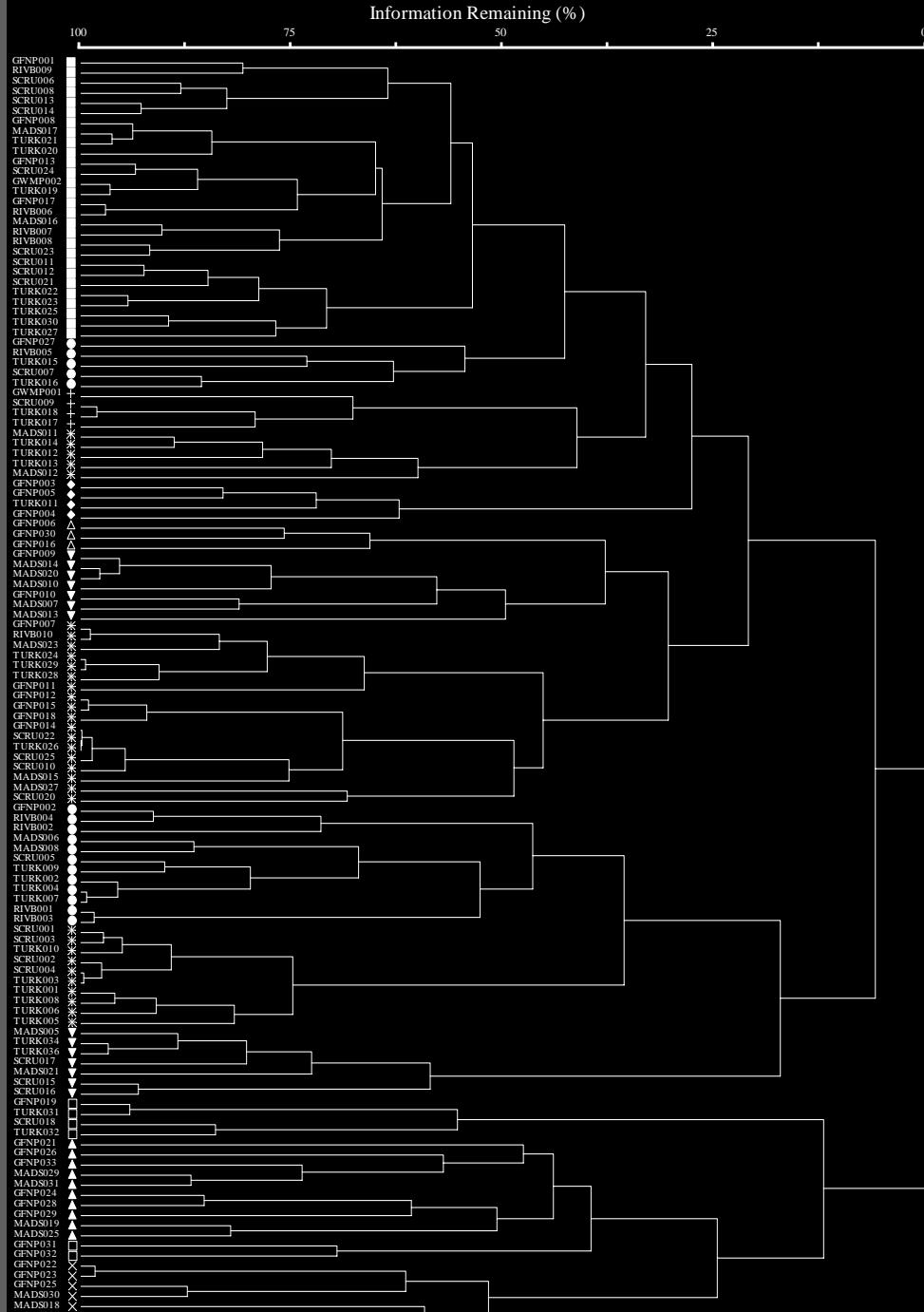
## View 1: Riverbend floodplain in April



# Seasonal variation in vegetation composition

## View 2: Riverbend floodplain in August



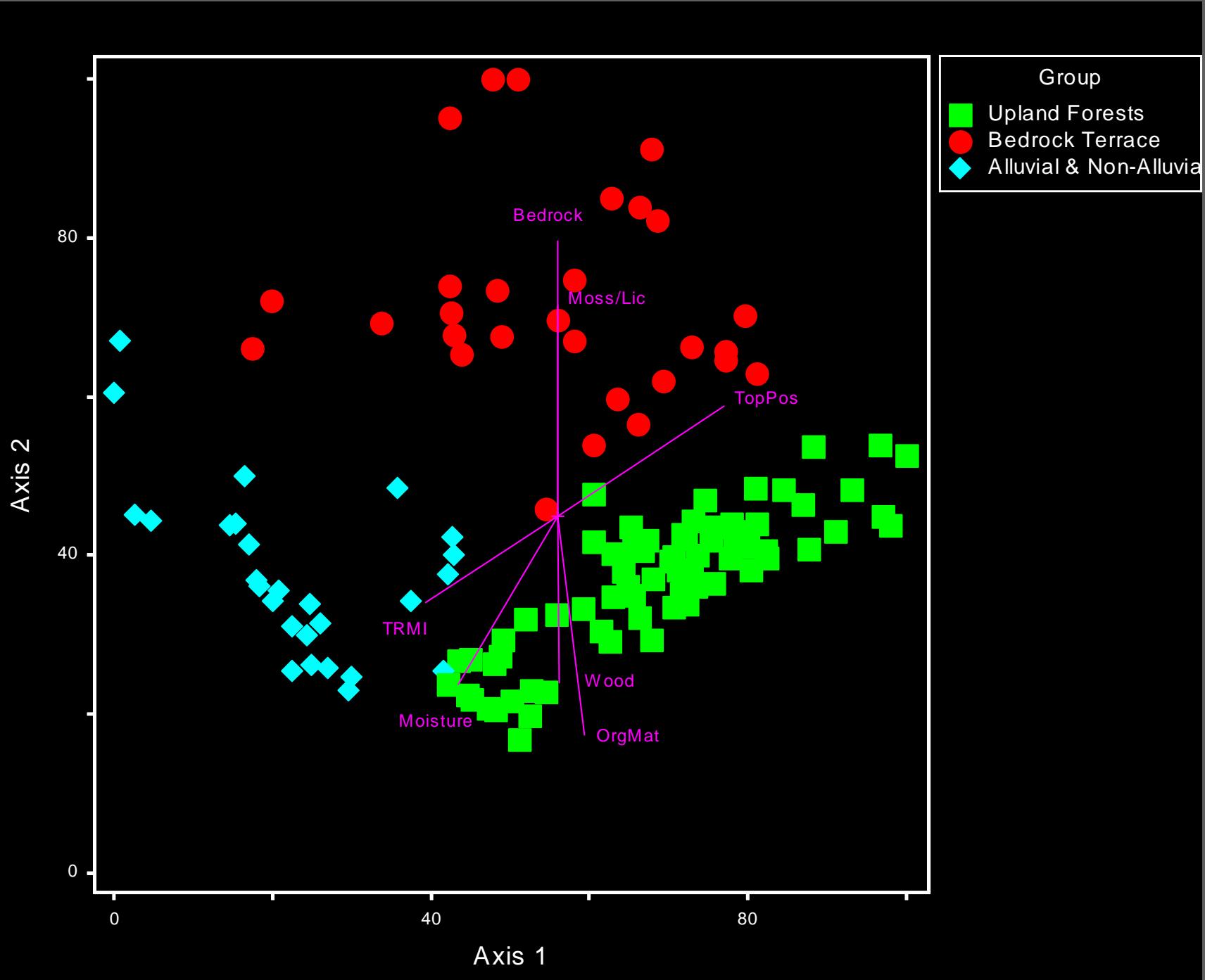


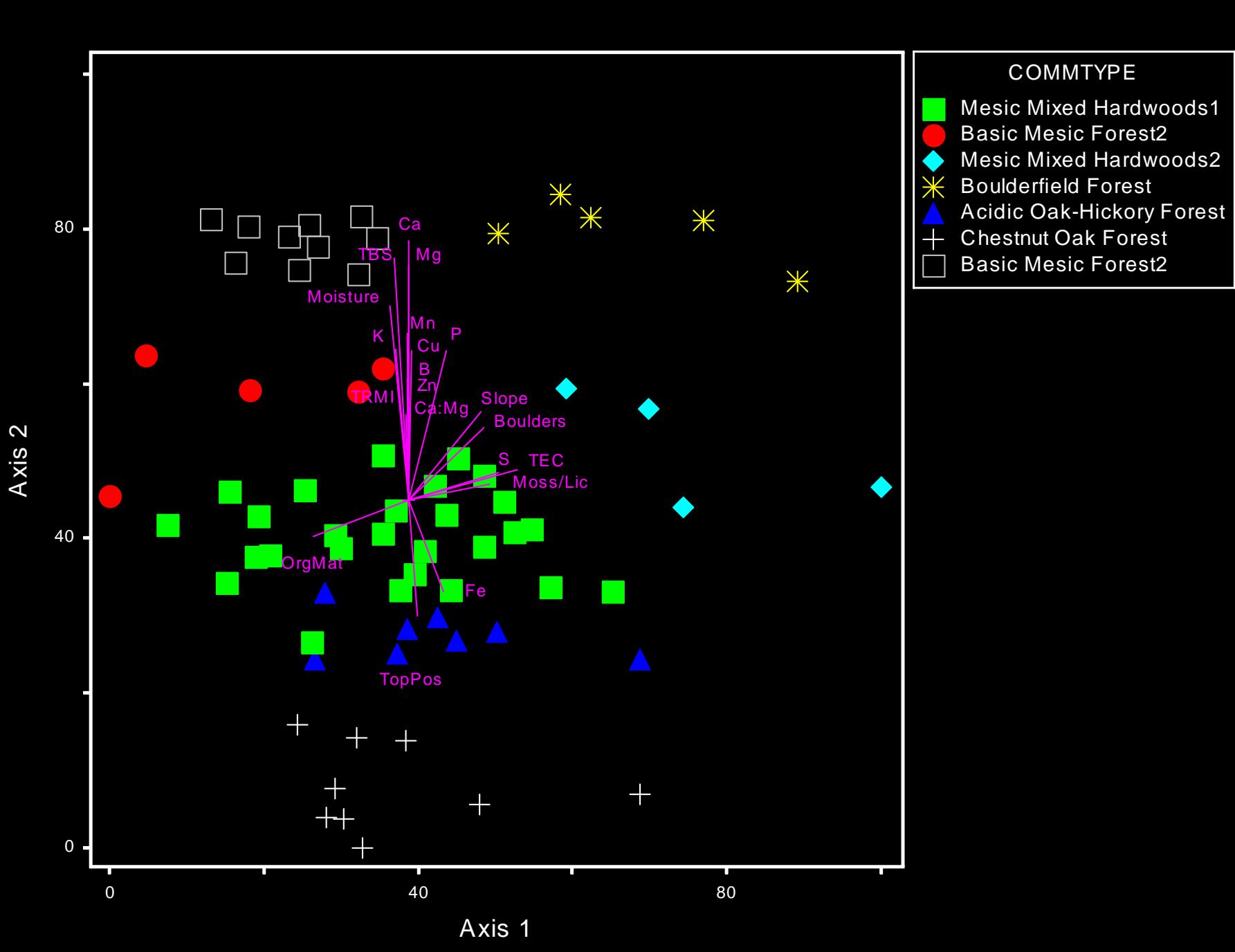
**Dendrogram showing Cluster analysis of 133 Potomac Gorge plots**



## Example of woody stem data summary for a group of plots

	Tree Density	Large Tree Density	TOTAL DENSITY	RELATIVE DENSITY	BASAL AREA	RELATIVE BASAL AREA	IV
Acer saccharinum	25	122	147	38.70	54.770	77.72	58.21
Acer negundo	116	25	141	32.14	8.615	14.90	23.52
Lindera benzoin	72	0	72	10.09	0.069	0.11	5.10
Ulmus americana	25	3	28	6.28	0.939	1.09	3.69
Asimina triloba	41	0	41	5.52	0.086	0.13	2.83
Platanus occidentalis	3	6	9	1.59	2.788	3.08	2.33
Parthenocissus quinquefolia	25	0	25	3.25	0.024	0.03	1.64
Juglans nigra	3	3	6	0.86	1.169	1.90	1.38
Fraxinus pennsylvanica	0	3	3	0.78	1.037	1.03	0.90
Toxicodendron radicans	3	0	3	0.78	0.003	0.00	0.39





## **EXAMPLE OF CLASSIFICATION HIERARCHY:**

**SYSTEM: PALUSTRINE**

**ECOLOGICAL CLASS: ALLUVIAL FLOODPLAIN COMMUNITIES**

**ECOLOGICAL GROUP: PIEDMONT / MOUNTAIN FLOODPLAIN FORESTS**

**COMMUNITY TYPES:**

*Acer saccharinum* – *Acer negundo* / *Laportea canadensis* –  
*Boehmeria cylindrica* – *Ageratina altissima* Forest (Piedmont / Central Appalachian Silver Maple Floodplain Forest, G4/S4)

*Platanus occidentalis* – *Acer negundo* – *Juglans nigra* / *Asimina triloba* / *Mertensia virginica* – *Hydrophyllum canadense* Forest (Piedmont / Central Appalachian Rich Floodplain Forest, G4/S4)

*For more information about the Virginia state ecological community classification system, go to:*

**VIRGINIA NATURAL HERITAGE PROGRAM  
COMMUNITY ECOLOGY WEB PAGE**

**Http://www.dcr.virginia.gov/dnh/nchome.htm**



# RESULTS

# VEGETATION AND FLORISTIC SUMMARY

## POTOMAC GORGE, VA

Total number of plots: 209  
forest/woodland: 169  
shrubland/herbaceous: 40  
Vascular taxa recorded: 755  
Indigenous spp: 635 (84%)  
Introduced spp: 120 (16%)  
Mean spp. richness / plot: 50.06

## COMPARISON WITH OTHER SITES

PROJECT	AREA (ha)	# PLOTS	# TAXA	MEAN SPP RICHNESS	BETA DIVERSITY	# COMM TYPES
Potomac Gorge	1,200	209	755	50.06	15.08	23
Bull Run Mountain	5,700	72	366	40.97	8.93	10
Shenandoah Natl Park	120,000	311	762	45.31	16.82	34

# Most frequent and abundant species of Potomac Gorge dataset

SPECIES	COMMON NAME	TOTAL FREQ	TOTAL MEAN COVER	TOTAL ABUND
<i>Parthenocissus quinquefolia</i>	Virginia creeper	150	2	340
<i>Asimina triloba</i>	paw-paw	136	6	661
<i>Liriodendron tulipifera</i>	tulip-poplar	121	6	593
<i>Acer rubrum</i>	red maple	116	6	579
<i>Toxicodendron radicans</i>	poison-ivy	113	2	270
<i>Fraxinus americana</i>	white ash	109	4	408
<i>Lindera benzoin</i>	spicebush	109	4	426
<i>Fagus grandifolia</i>	American beech	108	6	659
<i>Polystichum acrostichoides</i>	Christmas fern	100	4	336
<i>Aster divaricatus</i>	white wood aster	96	3	258
<i>Quercus rubra</i>	northern red oak	89	5	415
<i>Quercus montana</i>	chestnut oak	76	5	413
<i>Quercus alba</i>	white oak	63	5	354

# Most important woody species of forested plots

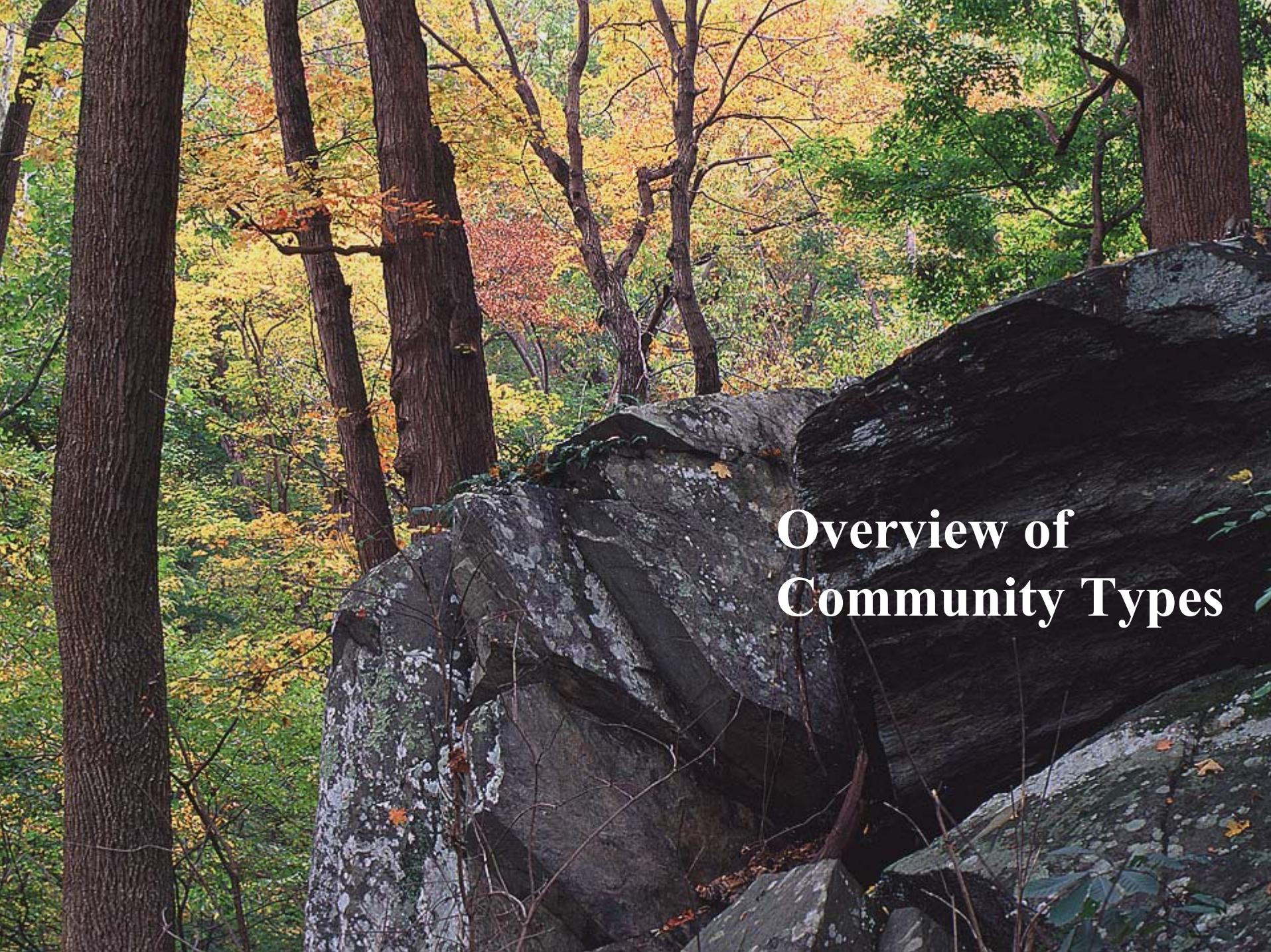
SPECIES	COMMON NAME	TREE DENSITY	LARGE TREE DENSITY	TOTAL DENSITY	RELATIVE DENSITY	BASAL AREA	REL. BASAL AREA	IMP. VAL.
<i>Fagus grandifolia</i>	American beech	119	11	130	15.80	3.95	8.52	12.16
<i>Liriodendron tulipifera</i>	tulip-poplar	18	17	35	3.95	6.79	12.80	8.38
<i>Quercus montana</i>	chestnut oak	19	16	35	3.23	5.05	10.65	6.94
<i>Acer rubrum</i>	red maple	91	2	93	9.83	1.23	3.87	6.85
<i>Asimina triloba</i>	paw-paw	134	0	134	11.30	0.29	0.67	5.99
<i>Quercus alba</i>	white oak	5	11	16	1.98	4.00	8.43	5.21
<i>Acer saccharinum</i>	silver maple	2	10	13	3.01	4.67	6.53	4.77
<i>Acer negundo</i>	boxelder	28	4	33	4.79	1.60	3.19	3.99
<i>Quercus rubra</i>	northern red oak	20	5	25	2.20	2.24	5.06	3.63
<i>Acer saccharum</i>	sugar maple	35	3	38	3.93	1.05	2.94	3.44
<i>Platanus occidentalis</i>	sycamore	5	8	13	1.52	3.77	5.03	3.27
<i>Nyssa sylvatica</i>	black gum	54	1	55	4.54	0.78	1.77	3.15
<i>Pinus virginiana</i>	Virginia pine	29	0	29	2.56	0.72	3.67	3.12
<i>Fraxinus americana</i>	white ash	16	5	21	1.83	1.68	3.77	2.80
<i>Carya glabra</i>	pignut hickory	18	2	20	1.78	1.10	3.25	2.51
<i>Tilia americana</i>	American basswood	14	2	16	1.64	1.11	2.51	2.07
48 other spp. comb.		245	18	263	26.12	7.32	17.33	21.72
<b>TOTALS</b>		<b>854</b>	<b>117</b>	<b>970</b>	<b>100.00</b>	<b>47.35</b>	<b>100.00</b>	<b>100.00</b>

# Largest individuals of major tree spp. in Potomac Gorge plots

SPECIES	COMMON NAME	DBH (CM)	DBH (IN)	HT (M)	HT (FT)	SITE
<i>Platanus occidentalis</i>	American sycamore	148	58	42	138	Turkey Run Park
<i>Ulmus americana</i>	American elm	131	52	34	112	Madeira School
<i>Acer saccharinum</i>	Silver maple	126	50	30	98	Turkey Run Park
<i>Quercus rubra</i>	Northern red oak	116	46	34	112	Great Falls Park
<i>Liriodendron tulipifera</i>	Tulip-poplar	111	44	33	108	G.W. Mem. Pkwy.
<i>Acer rubrum</i>	Red maple	110	43	36	118	Great Falls Park
<i>Quercus alba</i>	White oak	105	41	38	125	G.W. Mem. Pkwy.
<i>Fraxinus americana</i>	White ash	100	39	36	118	Scotts Run NP
<i>Quercus montana</i>	Chestnut oak	95	37	30	98	Turkey Run Park
<i>Quercus velutina</i>	Black oak	94	37	35	115	Scotts Run NP
<i>Quercus coccinea</i>	Scarlet oak	93	37	36	118	Great Falls Park
<i>Fagus grandifolia</i>	American beech	90	35	34	112	Turkey Run Park
<i>Carya glabra</i>	Pignut hickory	89	35	37	121	Scotts Run NP
<i>Tilia americana</i>	American basswood	82	32	25	82	Turkey Run Park
<i>Quercus shumardii</i>	Shumard oak	81	32	32	105	Riverbend Park
<i>Fraxinus pennsylvanica</i>	Green ash	79	31	33	108	Riverbend Park
<i>Tsuga canadensis</i>	Eastern hemlock	77	30	36	118	Scotts Run NP
<i>Carya cordiformis</i>	Bitternut hickory	72	28	36	118	Turkey Run Park
<i>Carya ovalis</i>	Red hickory	71	28	30	98	Turkey Run Park
<i>Populus deltoides</i>	Eastern cottonwood	70	28	34	112	Madeira School
<i>Acer saccharum</i>	Sugar maple	67	26	33	108	Scotts Run NP
<i>Acer negundo</i>	Boxelder	67	26	29	95	Turkey Run Park
<i>Ulmus rubra</i>	Slippery elm	66	26	33	108	Turkey Run Park
<i>Carya alba</i>	Mockernut hickory	64	25	32	105	Turkey Run Park
<i>Quercus stellata</i>	Post oak	63	25	29	95	Great Falls Park
<i>Celtis occidentalis</i>	Hackberry	60	24	32	105	Turkey Run Park
<i>Juglans nigra</i>	Black walnut	59	23	34	112	Turkey Run Park
<i>Nyssa sylvatica</i>	Black gum	56	22	27	89	Great Falls Park



*Platanus occidentalis* (American sycamore) 148 cm DBH, 42 m tall, Turkey Run Park

A photograph of a forest scene. In the foreground, several large, dark grey rocks are scattered across the ground. Some of the rocks have patches of green moss or lichen growing on them. The ground is covered with fallen leaves in shades of yellow, orange, and brown, indicating autumn. In the background, there are many trees with different colored foliage: some are still green, while others have turned yellow, orange, and red. The overall atmosphere is a natural, outdoor setting.

# Overview of Community Types

Ecological Group: Mesic Mixed Hardwood Forests

*Fagus grandifolia – Liriodendron tulipifera – Quercus alba /*  
*Polystichum acrostichoides – (Thelypteris noveboracensis) Forest*





Mature *Fagus grandifolia* (American beech) 90 cm DBH, 36 m tall, Turkey Run Park

## Mesic Mixed Hardwood Forest (Piedmont / Northern Coastal Plain Type)

- mesic, infertile slopes throughout
- silt loam soils; extremely acidic with low base status
- 35 plots
- Mean species richness = 53
- Conservation Ranks: G5/S5



Forest floor in a mesic mixed hardwood forest



Deer-browsed stand with patchy *Thelypteris noveboracensis* (New York fern), Riverbend Park



*Polystichum acrostichoides* (Christmas Fern)

Ecological Group: Basic Mesic Forests

*Liriodendron tulipifera – Fagus grandifolia – Quercus rubra / Asimina triloba / Podophyllum peltatum* Forest





*Liriodendron tulipifera* (tulip-poplar)



*Cimicifuga racemosa*  
(black bugbane)



*Uvularia perfoliata*  
(perfoliate bellwort)

## Basic Mesic Forest (Coastal Plain / Outer Piedmont Type)

- mesic, moderately fertile slopes; locally throughout the Gorge
- silt loam soils with relatively high pH, Mg, and total base saturation; high Mn
- 20 plots
- Mean species richness = 55
- Conservation ranks: G4?/S3



*Adiantum pedatum*  
(maidenhair fern)



*Podophyllum peltatum* (may-apple)



Ecological Group: Basic Mesic Forests

*Fagus grandifolia – Acer saccharum / Lindera benzoin / Caulophyllum thalictroides – Dicentra cucullaria* Forest



*Trillium sessile* (toadshade; red form)

## Basic Mesic Forest (Beech – Sugar Maple Unglaciated Type)

- mesic, N to E-facing ravines and lower slopes near mafic and ultramafic intrusions; local in middle section of the Gorge (VA side only?)
- silt loam soils with relatively high Ca, Mg, and Mn
- 14 plots
- Mean species richness = 45
- Conservation ranks: G4?/S2?
- In Virginia, known only from the Potomac drainage



Toadshade; yellow form



*Acer saccharum* (sugar maple)



*Dicentra cucullaria* (Dutchman's-breeches)



*Erythronium americanum* (yellow trout-lily)





Ecological Group: Low-Elevation Boulderfield Forests & Woodlands

*Acer saccharum – Tilia americana – Fraxinus americana /*  
*Staphylea trifolia / Impatiens pallida* Forest





*Staphylea trifolia*  
(bladdernut)

## Low-Elevation Boulderfield Forest / Woodland (Northern Piedmont Basic Type)

- very steep, boulder-strewn, lower and middle river-fronting slopes; extensive in middle section of Gorge (VA side only?)
- interstitial silt loam soils with high Ca, Mg, Mn
- 10 plots
- Mean species richness = 34
- Conservation ranks: G4?/S3?



*Tilia americana* var. *americana*  
(American basswood)



*Impatiens pallida*  
(yellow jewelweed)



Boulderfield forest with *Toxicodendron radicans* (poison-ivy), Scotts Run NP



Northern copperhead (*Agkistrodon contortrix mokasen*) at Scotts Run NP



Ecological Group: Montane Mixed  
Oak & Oak-Hickory Forests

*Quercus montana* – *Acer*  
*saccharum* / *Ostrya*  
*virginiana* / *Aster*  
*divaricatus* – *Dryopteris*  
*marginalis* – *Carex*  
*communis* Forest



*Dryopteris marginalis*  
(marginal wood fern)

*Aster divaricatus*  
(white wood aster)

## Central Appalachian / Northern Piedmont Mixed Oak Bluff Forest

- very steep, N-facing middle and upper slopes; local in middle and lower sections of the Gorge (VA side only?)
- silt loam soils; extremely acidic with low base status
- 7 plots
- Mean species richness = 53
- Conservation ranks: GNR/SNR



*Carex platyphylla*  
(broad-leaved sedge)

Ecological Group: Acidic Oak-Hickory Forests

*Quercus alba* – *Quercus rubra* – *Carya alba* / *Cornus florida* /  
Forest





*Cornus florida* (flowering dogwood)



*Quercus velutina*  
(black oak)



*Carya* (hickory) leaves  
unfolding in spring

## Piedmont Acidic Oak-Hickory Forest

- submesic to subxeric, convex middle to upper slopes, usually S to W-facing
- silt loam soils; acidic with moderate base status
- 8 plots
- Mean species richness = 76
- Conservation ranks: G5?/S5
- oak recruitment very poor and many stands succeeding to beech / mesic mixed hardwoods



*Cunila origanoides* (wild dittany)



Young *Fagus grandifolia* (American beech) invading an acidic oak-hickory forest

Ecological Group: Oak / Heath Forests

*Quercus montana* – (*Quercus coccinea*, *Quercus rubra*) /  
*Kalmia latifolia* / *Vaccinium pallidum* Forest



## Central Appalachian / Northern Piedmont Chestnut Oak Forest

- xeric crests and upper slopes, some very rocky
- silty clay loam soils; extremely acidic with low base status
- 17 plots
- Mean species richness = 25
- Conservation ranks: G5/S5



*Quercus coccinea* (scarlet oak)



*Gaylussacia baccata*  
(black huckleberry)



*Kalmia latifolia*  
(mountain-laurel)



*Pinus pungens*  
(table-mountain pine)



*Rhododendron maximum*  
(great rhododendron)



*Castanea dentata*  
(American chestnut)



Ecological Group: Eastern Hemlock-Hardwood Forests  
*Tsuga canadensis – Quercus montana / Kalmia latifolia*  
Forest



*Tsuga canadensis* (eastern hemlock)



*Betula lenta* (sweet birch)

## Eastern Hemlock – Chestnut Oak Forest

- mesic, sheltered, rocky lower slopes; very local (Va side only)
- silt loam soils; extremely acidic with low base status
- 4 plots
- Mean species richness = 30
- Conservation ranks: GNR/SNR
- threatened with extirpation due to woolly adelgid infestation



*Polypodium virginianum* (rock polypody)

Ecological Group: Basic Oak-Hickory Forests

*Carya glabra – Quercus (alba, stellata, montana) / Viburnum rafinesquianum / Dichanthelium boscii* Forest





*Quercus stellata* (post oak)

## Basic Oak-Hickory Forest (Potomac River Bedrock Terrace Type)

- subxeric, gentle, rocky bedrock terraces
- 30 to 85-year flood return interval
- shallow, sandy loam soil; extremely acidic with low base status
- 5 plots
- Mean species richness = 94
- Conservation ranks: G1G2/S1
- Endemic to the Potomac Gorge (Md and Va)



*Chionanthus virginicus*  
(fringetree)



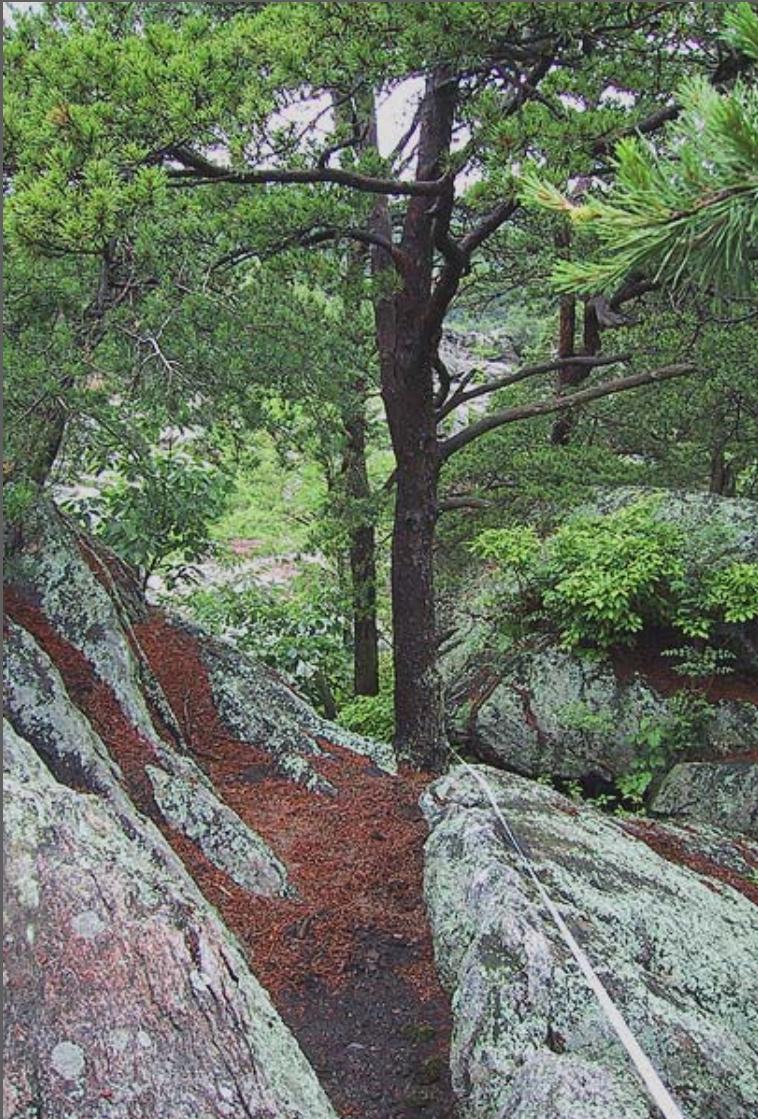
*Dichanthelium boscii*  
(Bosc's panic grass)



*Viburnum rafinesquianum*  
(downy arrow-wood) U of Tenn



Ecological Group: Mountain /  
Piedmont Acidic Woodlands  
*Pinus virginiana* –  
*Juniperus virginiana* /  
*Vaccinium pallidum* /  
*Carex pensylvanica*  
Woodland



*Pinus virginiana* (Virginia Pine)

## Riverside Bedrock Terrace Woodland

- xeric rimrock of bedrock terraces
- 12 to 30-year flood return interval
- sparse to shallow, sandy loam soil; extremely acidic with low base status
- 5 plots
- Mean species richness = 35
- Conservation ranks: GNR/S1
- Known only from Potomac Gorge (Va and Md) and New River Gorge (WVa)



*Juniperus virginiana*  
(eastern red cedar)



*Vaccinium pallidum*  
(lowbush blueberry)

Ecological Group: Riverside Prairies

*Fraxinus americana / Andropogon gerardii – Sorghastrum nutans –*  
*Panicum virgatum – Baptisia australis* Wooded Herbaceous  
Vegetation





**Bedrock terrace prairie near mouth of Difficult Run, Madeira School**



*Andropogon gerardii* (big bluestem)

## Piedmont / Central Appalachian Riverside Prairie

- very rocky, lower bedrock terraces and channel shelves; ephemeral pools usually present
- 0.5 to 7-year flood return interval
- loamy sand soils with high pH and Ca
- 9 plots
- Mean species richness = 87
- Conservation ranks: G2G3/S1



*Panicum virgatum* (switchgrass)



*Baptisia australis* (wild blue indigo)

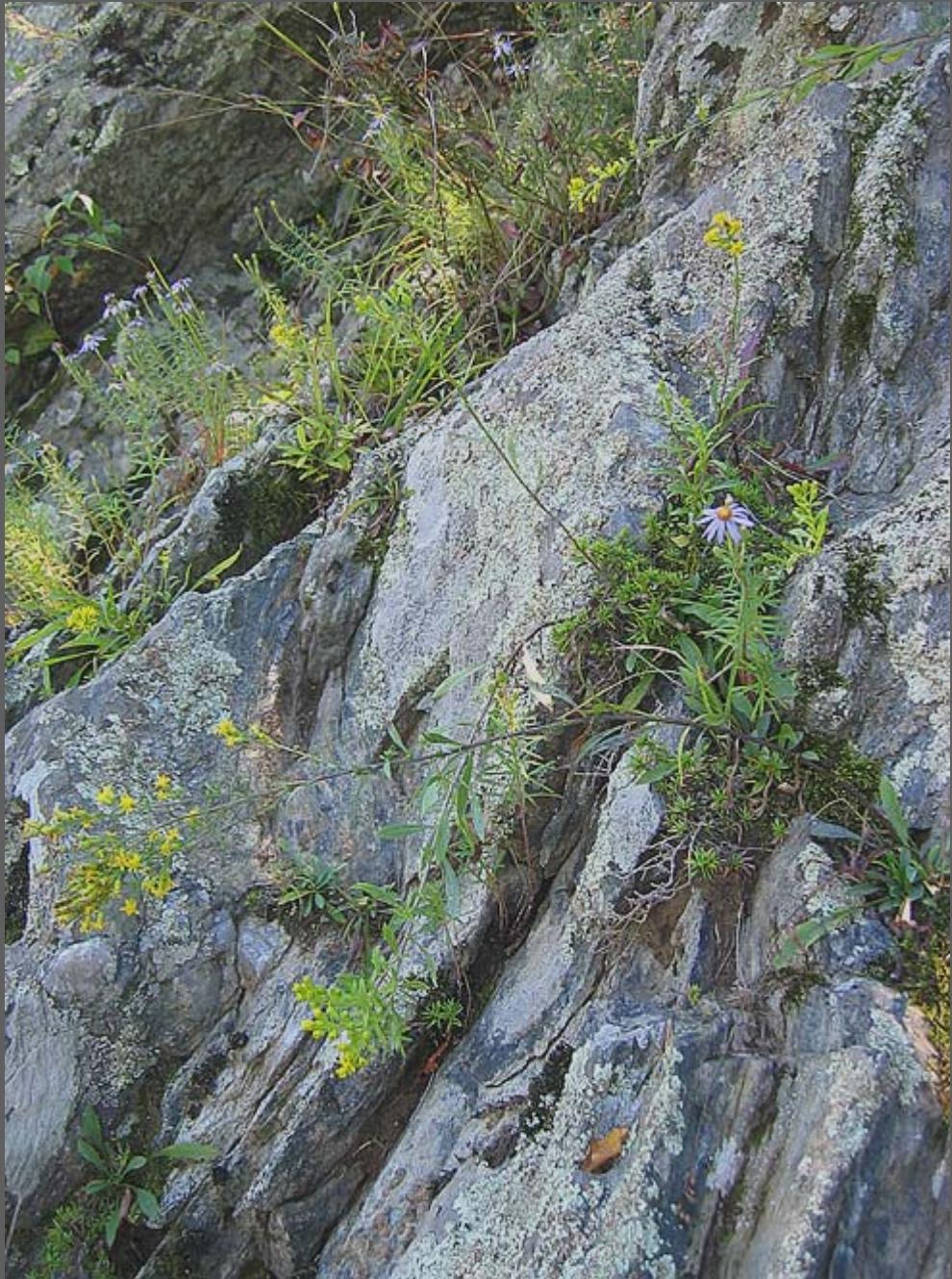


*Sorghastrum nutans* (indian-grass)

Ecological Group: Riverside Outcrop Barrens

*Leucothoe racemosa / Schizachyrium scoparium – Solidago  
racemosa – Ionactis linariifolius Sparse Herbaceous Vegetation*





*Solidago racemosa* (sticky goldenrod)

## Riverside Outcrop Barren (Potomac Gorge Type)

- very xeric, exposed, periodically scoured rock outcrops
- 1 to 12-year flood return interval
- mineral soil extremely sparse to absent (could not be extracted from plots)
- 9 plots
- Mean species richness = 22
- Conservation ranks: G2?/S1
- Endemic to the Potomac Gorge



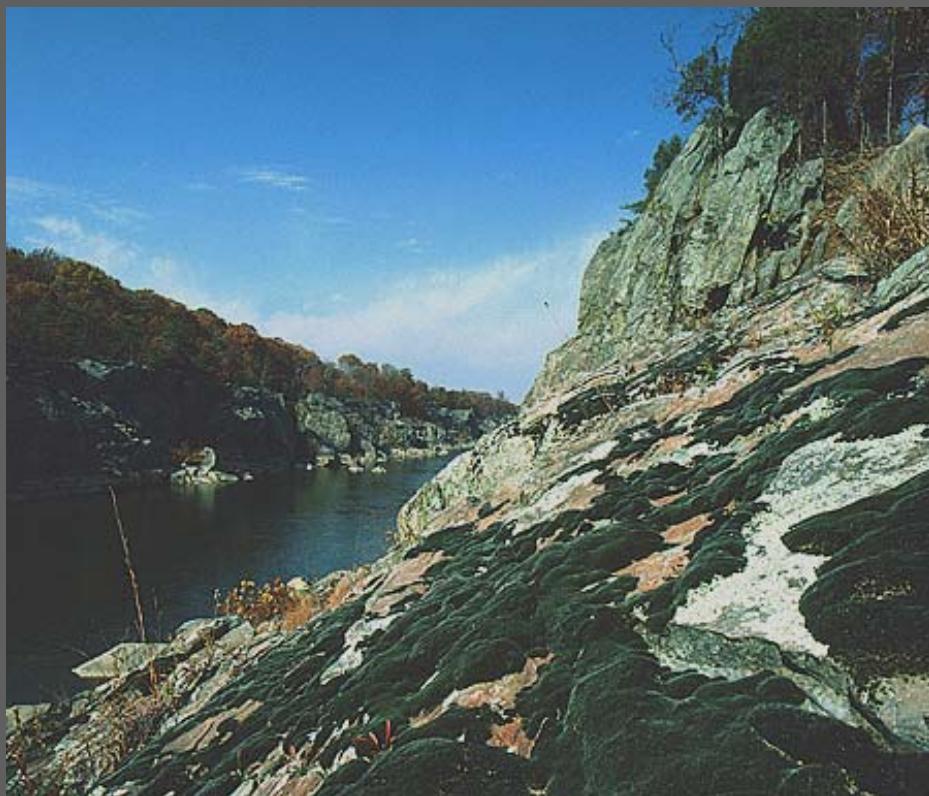
*Schizachyrium scoparium* (little bluestem)



Sparse vegetation dominated by the lichen *Xanthoparmelia conspersa*, *Schizachyrium scoparium* (little bluestem), and *Solidago racemosa* (sticky goldenrod)



Crustose lichens on undisturbed outcrop



*Grimmia laevigata* on ephemeral wet outcrop

Ecological Group: Floodplain Pools and Ponds

*Nuphar advena* Semipermanently Flooded Herbaceous Vegetation





*Nuphar advena* (spatterdock)



*Sparganium americanum* (American bur-reed)

## Floodplain Pool / Pond (Spatterdock Type)

- borders of deep bedrock terrace pond
- substrate more or less permanently flooded except during prolonged dry periods
- sand substrate; moderately fertile
- 1 plot
- Species richness = 4
- Conservation ranks: GNR/SNR
- probably a very rare natural community type

Ecological Group: Coastal Plain / Piedmont Basic Seepage Swamps

*Acer rubrum / Ilex verticillata / Symplocarpus foetidus – Saururus cernuus* Saturated Forest



## Northern Piedmont / Lower New England Basic Seepage Swamp

- flat, groundwater-saturated stream bottoms
- silty clay loam soils with relatively high pH, Ca, Mg; very high Fe
- 5 plots
- Mean species richness = 51
- Conservation ranks: G4G5/S2?

*Acer rubrum* (red maple)



*Ilex verticillata* (winterberry)



*Symplocarpus foetidus*  
(skunk-cabbage)



*Osmunda cinnamomea*  
(cinnamon fern)





Ecological Group: Sand / Gravel / Mud Bars and Shores

*Eragrostis hypnoides* – *Lindernia dubia* – *Ludwigia palustris* –  
*Cyperus squarrosus* Herbaceous Vegetation



## Piedmont / Mountain Sand Bar / River Shore (Low Herbaceous Type)

- habitats seasonally exposed during low-water periods
- fine-textured silty soils with very high calcium and total base saturation
- vegetation predominantly of low herbaceous annuals
- 9 plots
- Mean species richness = 51
- Conservation ranks: GNR/SNR
- Occurs along major rivers throughout the Piedmont and Mountain regions





*Eragrostis hypnoides*  
(creeping lovegrass)



*Lindernia dubia* var. *dubia*  
(false pimpernel)



*Cyperus squarrosus* (awned flatsedge)



Ecological Group: Piedmont /  
Mountain Floodplain Forests  
*Acer saccharinum* – *Acer negundo* / *Laportea canadensis* – *Boehmeria cylindrica* – *Ageratina altissima* Forest

Photo: Karen D. Patterson

## Piedmont / Central Appalachian Silver Maple Floodplain Forest

- riverbanks and low floodplain terraces
- 0.35 to 2-year flood return interval
- loamy sand soils with very high pH, Ca, Mg, and total base saturation
- 10 plots
- Mean species richness = 43
- Conservation ranks: G4/S4



*Laportea canadensis* (wood-nettle)



*Ageratina altissima*  
(white snakeroot)



*Populus deltoides*  
(eastern cottonwood)

Ecological Group: Piedmont / Mountain Floodplain Forests

*Platanus occidentalis – Acer negundo / Asimina triloba /*  
*Mertensia virginica – Hydrophyllum canadense* Forest





*Platanus occidentalis* (American sycamore)



*Erythronium albidum*  
(white trout-lily)



*Asarum canadense*  
(wild ginger)

## Piedmont / Central Appalachian Rich Floodplain Forest

- elevated floodplain terraces and alluvial berms
- 2 to 12-year flood return interval
- sandy or silt loam soils with high pH, Ca, Mg, total base saturation
- 13 plots
- Mean species richness = 44
- Conservation ranks: G4/S4



*Phlox divaricata* (wild blue phlox)



Large clone of *Hydrophyllum canadense* (Canada waterleaf), Turkey Run Park

Ecological Group: Rocky Bars and Shores

*Justicia americana* Seasonally Flooded Herbaceous Vegetation





## Rocky Bar and Shore (Water-Willow Type)

- bouldery and cobbley river shores / depositional bars
- flooded > 50% of the year
- sparse, sandy soil; very high pH and Ca levels
- 5 plots
- Mean species richness = 9
- Conservation ranks: G4G5/S4



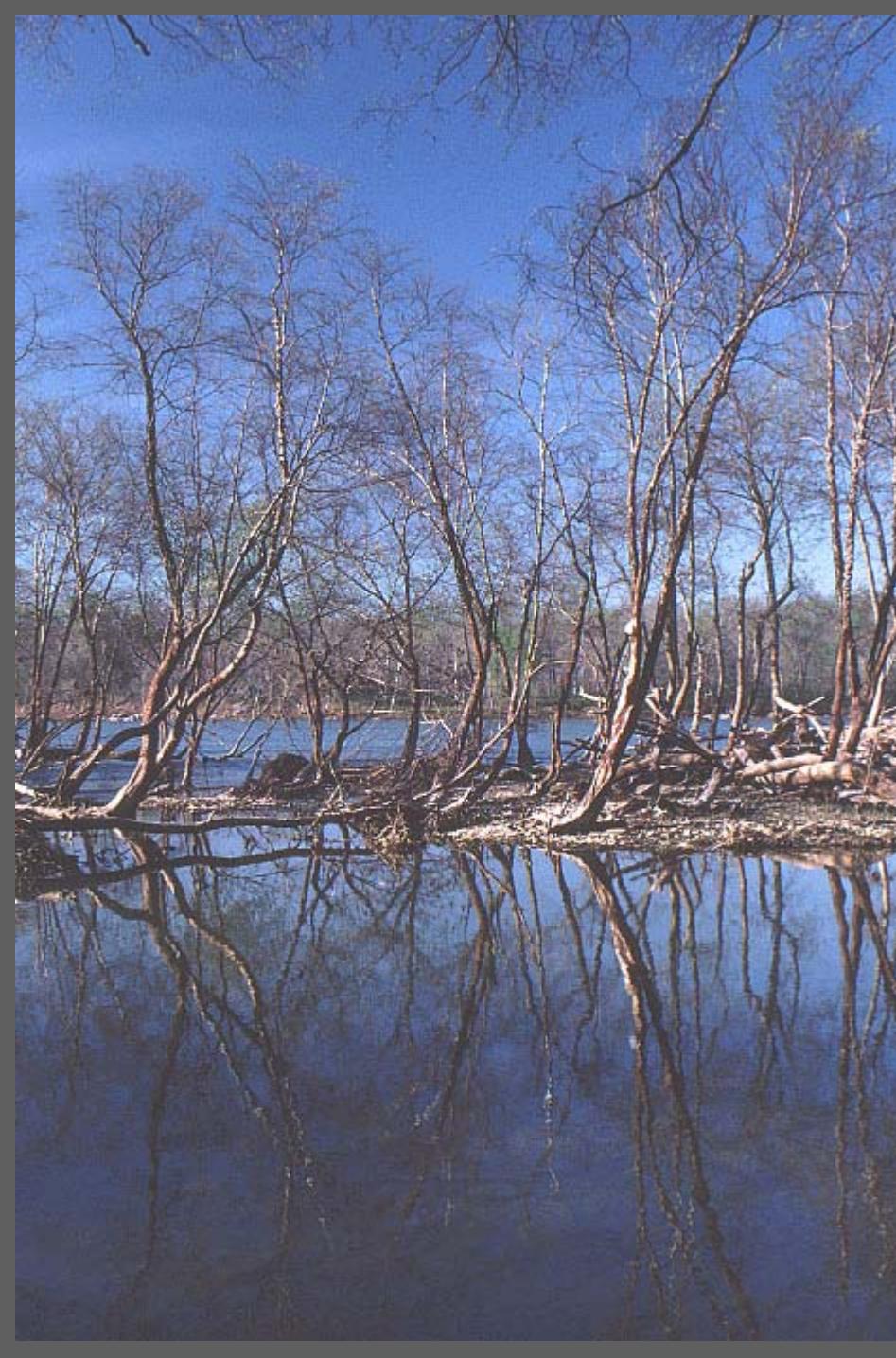
*Hibiscus laevis* (halberd-leaf rose-mallow)

Ecological Group: Rocky Bars and Shores

*Platanus occidentalis – Betula nigra / Apocynum sibiricum*

Woodland





## River-Scour Woodland (Sycamore – River Birch Depositional Bar Type)

- coarse, bouldery-cobbly, frequently flood-scoured depositional bars
- < 1-year flood return interval
- sandy, moderately fertile soil is largely interstitial; may be sparse
- vegetation usually exhibits extensive mechanical damage and flood-training
- 8 plots
- Mean species richness = 63
- Conservation ranks: GNR/SNR
- Widespread along high-gradient rivers in the Mid-Atlantic Piedmont and Mountains



Flood-trained trees on a rocky bar at Scotts Run Nature Preserve

Ecological Group: Rocky Bars and Shores

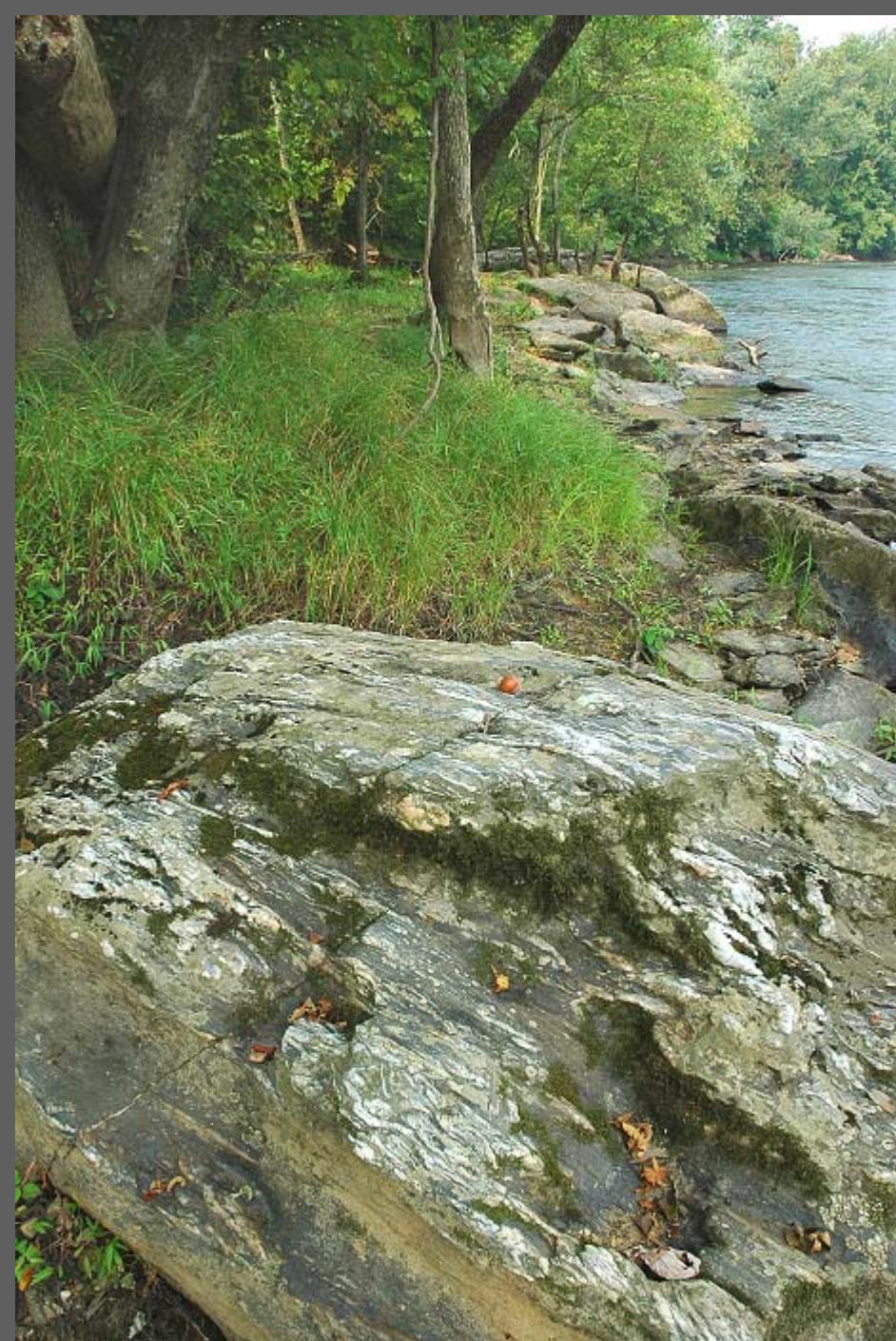
*Fraxinus pennsylvanica* – *Ulmus americana* – *Diospyros virginiana*  
/ *Teucrium canadense* – *Carex emoryi* Woodland



Photo: J.C. Ludwig

## River-Scour Woodland (Mixed Bedrock Floodplain Type)

- occupies bedrock floodplains with irregular microtopography and some soil development
- < 1-year flood return interval
- fertile, sandy soil developed locally
- vegetation very diverse and species-rich, trees usually damaged and flood-trained from frequent scouring
- 4 plots
- Mean species richness = 111
- Conservation ranks: GNR/SNR
- possibly endemic to the Potomac drainage









# Threats documented by plot data

## Pervasive Threats

- Invasive introduced plants
- Excessive browsing/grazing by white-tailed deer



## Local Area Threats

- Insect and fungal pathogens
  - dogwood anthracnose
  - hemlock woolly adelgid
  - butternut canker
  - gypsy moth
- Visitor over-usage (trampling, etc.)
- Fire exclusion (dry oak forests)

# Leading introduced invasives in Potomac Gorge dataset

90% of 209 plots contained at least one introduced species

TAXON	TOTAL FREQ	CONST	NO. OF COMM. TYPES	TOTAL MEAN COVER	TOTAL ABUND
<i>Alliaria petiolata</i>	83	40	16	4	276
<i>Lonicera japonica</i>	77	37	17	2	188
<i>Microstegium vimineum</i>	67	32	17	2	155
<i>Polygonum cespitosum</i> var. <i>longisetum</i>	55	26	15	2	113
<i>Celastrus orbiculatus</i>	55	26	15	1	88
<i>Veronica hederifolia</i>	54	26	11	3	169
<i>Artemisia annua</i>	41	20	9	2	97
<i>Prunus subhirtella</i>	40	19	8	1	60
<i>Eclipta prostrata</i>	31	15	8	1	54
<i>Ailanthus altissima</i>	30	14	16	1	40
<i>Glechoma hederacea</i>	26	12	12	2	76
<i>Perilla frutescens</i>	25	12	6	2	52
<i>Urtica dioica</i> ssp. <i>dioica</i>	24	11	8	3	90
<i>Arthraxon hispidus</i>	24	11	6	1	45
<i>Rosa multiflora</i>	22	11	11	1	47
<i>Rubus phoenicolasmus</i>	22	11	11	1	44
104 others (mean)	6	3		1	10
AVERAGES	10.43	4.99	11.63	1.20	22.37



*Microstegium vimineum* (stilt grass)



*Alliaria petiolata* (garlic-mustard)



*Hedera helix* (English ivy)



*Phyllostachys* sp. (bamboo)

# Effectiveness of “Coarse Filter” Approach to Inventory

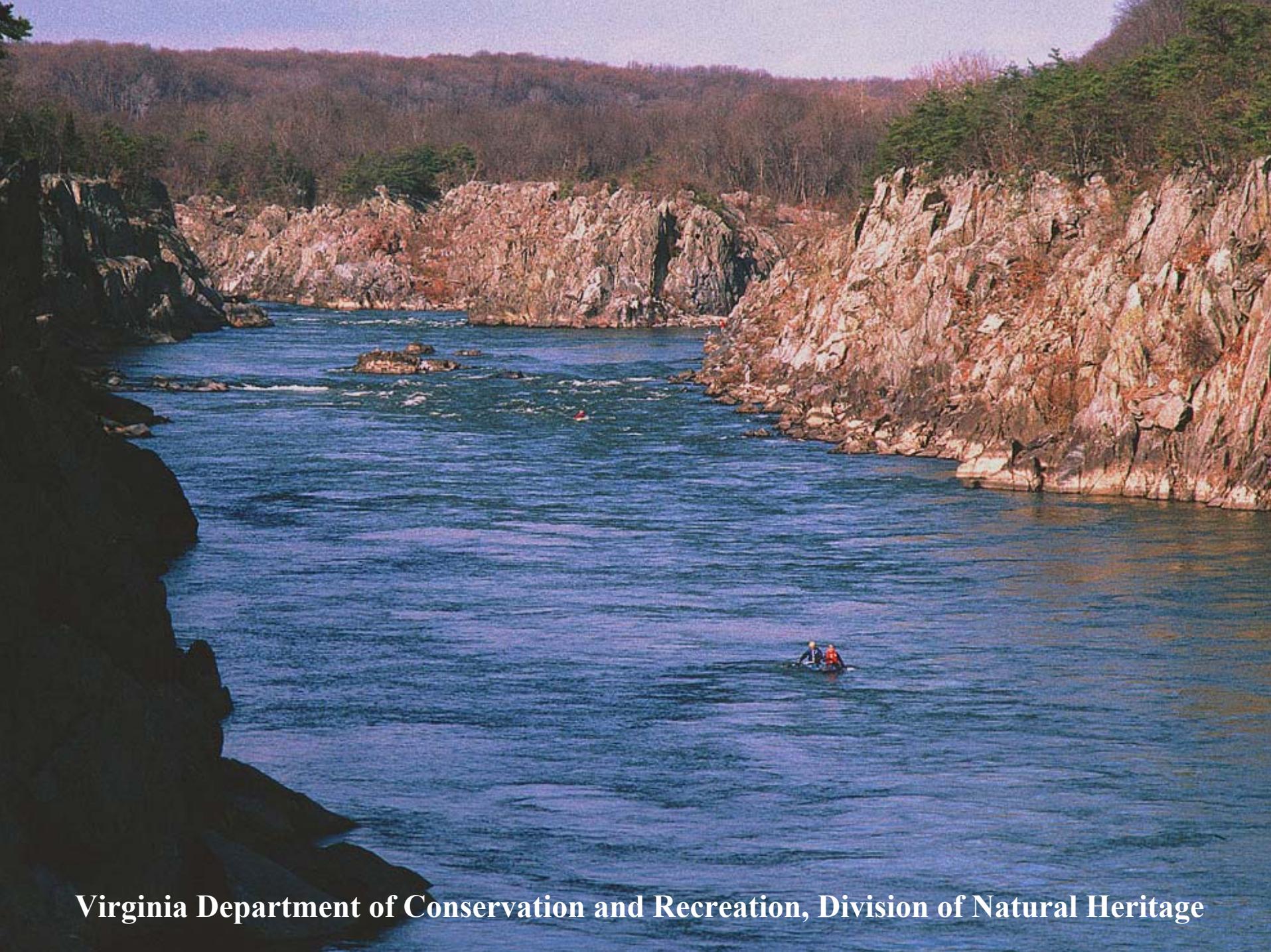
- 69% of Va-side flora (755 of ~1100 taxa) captured in plots (area < 8 ha)
- 80% (28 of 35) of extant (Va) species of conservation concern captured in plots
- 135 occurrences of species of conservation concern in plots
- 76 plots (36% of dataset) contained at least one species of conservation concern

Species of Conservation Concern	Grank	Srank	No. of Plots	No. of Comtypes
<i>Acalypha deamii</i>	G4?	S3	1	1
<i>Amelanchier nantucketensis</i>	G3Q	S1	2	1
<i>Baptisia australis</i> var. <i>australis</i>	G5T4?	S3	7	3
<i>Carex careyana</i>	G5	S3	2	2
<i>Carex conjuncta</i>	G4G5	S3	4	2
<i>Carex hirtifolia</i>	G5	S3	1	1
<i>Carex straminea</i>	G5	S1	2	1
<i>Cerastium arvense</i> ssp. <i>velutinum</i>	G5T4	S2?	8	3
<i>Cornus amomum</i> ssp. <i>obliqua</i>	G5T5	SU	3	2
<i>Desmodium cuspidatum</i> var. <i>cuspidatum</i>	G5T5?	S2	1	1
<i>Eleocharis compressa</i>	G4	S2	4	2
<i>Eriogonum bulbosa</i>	G5	S3	16	5
<i>Erythronium albidum</i>	G5	S2	3	1
<i>Floerkea proserpinacoides</i>	G5	S3	8	3

## Extant (Va) species of conservation concern captured in plots, continued:

Species of Conservation Concern	Grank	Srank	No. of Plots	No. of Comtypes
<i>Hasteola suaveolens</i>	G3G4	S2	1	1
<i>Helianthus occidentalis</i>	G5	S1	5	2
<i>Hemicarpha micrantha</i>	G4	S1	7	2
<i>Maianthemum stellatum</i>	G5	S2?	1	1
<i>Matteuccia struthiopteris</i> var. <i>pensylvanica</i>	G5T?	S1	3	2
<i>Onosmodium virginianum</i>	G4	S2	2	2
<i>Phacelia covillei</i>	G2	S1	6	4
<i>Rhododendron arborescens</i>	G4G5	S2	4	3
<i>Rorippa sessiliflora</i>	G5	S1	1	1
<i>Sanicula trifoliata</i>	G4	S3	12	4
<i>Solidago racemosa</i>	G5T4?	S1	23	4
<i>Solidago rupestris</i>	G4?	S1	3	3
<i>Spartina pectinata</i>	G5	S2	2	2
<i>Valeriana pauciflora</i>	G4	S2	3	2





**Virginia Department of Conservation and Recreation, Division of Natural Heritage**